JAN 20 1927

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Interior view of the new Merchants Exchange Building, San Francisco—showing Elevator Cages and Elevator Grill, finished with Egyptian Lacquer

Metals take on a velvety depth of tone and color

What is that subtle something which makes one product *sell* and another almost *sales-proof*—in spite of quality?

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THE
METAL INDUSTRY
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ELECTRO-PLATERS REVIEW

Vol. 25 NEW YORK, JANUARY, 1927 No. 1

A Large and Unusual Brass Foundry

A Detailed Description of the Brass Foundry of William Cramp & Sons Ship & Engine Building Company

The brass foundry of the William Cramp & Sons Ship & Engine Building Company of Philadelphia, Pa., is unique in many respects. In the first place it is one of the large foundries of the United States. In the second place it specializes in the most unusual and difficult work which can be attempted by brass foundries. In other words, if a job is too hard to be done elsewhere, the Cramp foundries will tackle it.

Their main specialty is of course marine work for their own shipyards, but a large variety of jobbing work is also done. The wide range of work which this foundry covers is shown by the fact that they have 92 mixtures or alloys in use.

The description of the operation and contents of these foundries will be taken up by departments which are as follows:

Small Foundry.
Large Foundry.
Ingot Foundry.
Accessory departments, such as cleaning, tumbling, snagging, grinding, etc.

SMALL FOUNDRY

The small foundry is used for marine castings and general jobbing work up to 600 pounds in weight. The equipment consists of 24 pit furnaces, coke-fitted contain-

MACHINE SHOP NO. 1. CLOSE-UP VIEW OF PROPELLERS AND MACHINES

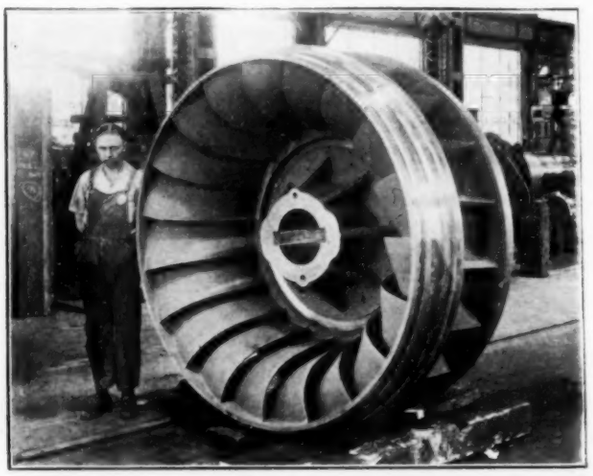
ing No. 175 crucibles; 4 Hawley-Schwartz down-draft furnaces, oil-fired, with a capacity of 1,200 pounds per heat. The molding equipment consists of 1,400 match plates; a number of vibrators, and of course, tubs, benches and floor molding facilities. Of the handling equipment, the most important items are two 1-ton jib cranes. This foundry is large enough to accommodate 42 molders.

This department also includes a cleaning department in which is one tumbling barrel, 3 hoppers and a complete sand blast room.

A great deal of small work goes through this division most of it tending toward quantity or production material. At the same time a surprisingly large amount of special and difficult work is done of the type generally avoided by the ordinary jobbing foundry because of the mechanical or metallurgical problems involved.

LARGE FOUNDRY

The large foundry is used for castings over 600 lbs. in weight. The outstanding feature of the equipment in this foundry is the reverberatory melting furnace in-



BRONZE RUNNER WEIGHING 12,700 LBS.

stallation. This consists of two reverberatory furnaces, each with a capacity of 40,000 pounds of metal. They are used for large casting work demanded by propeller wheels, for example. These furnaces are coal fired and can be handled so as to turn out a heat in a working day of 8 to 10 hours. Draft is induced by a large stack which is connected to the two furnaces by a main flue. No forced draft is used, as sufficient heat within the required time can be obtained by skillful firing.

The reverberatory furnace can be charged with ingots or pigs through side doors, but when necessary or desirable, the roof can be removed and large pieces of metal laid directly on the floor. The roof is then replaced in sections, luted with fire clay and the furnace fired to the necessary heat.

Necessarily, in an installation of this kind, much depends upon the skill of the furnace operator who must keep the furnace up to heat, the doors closed to avoid contamination of the metal and the charge thoroughly puddled and stirred. Charcoal is used to protect the surface of the metal.

Additional melting equipment includes 10 pit fires holding No. 300 crucibles. Also there are three core ovens 12′ x 45′, all oil-fired. The size of these ovens is due to the fact that in large complicated castings the mold consists to a great extent of cores which are unusual in size and shape.

This foundry has a great deal of special molding equipment for propeller wheels and blades. Most of this equipment has been developed within the organization with the object of standardizing its methods. The foundry has a capacity of 62 molders.

Of the handling equipment in this large foundry, the most important items are two 25-ton, two 15-ton and two 5-ton overhead traveling cranes.

INGOT FOUNDRY

The ingot foundry is the department used for making ingot metals, of a large number of special brands marked by the Cramp Company and also on specification to suit the purchaser. Among these ingots are the following:

Phosphor Bronze.
Manganese Bronze.
Damaxine (copper base bearing metal developed by the company).
Babbitts (lead and tin base).
Parsons' White Brass of various types.
Government babbitts.
Diesel Engine babbitts.
Gear metals.
Solders (lead and tin; also aluminum solder and cast iron solder).

The equipment of this department consists of ten pit fires holding No. 300 crucibles. It also uses ten pit fires in the large foundry. Accessory equipment such as ingot molds, etc., is in proportion to the melting equipment. The foundry can accommodate 15 men.

SPECIAL FEATURES OF THE PLANT

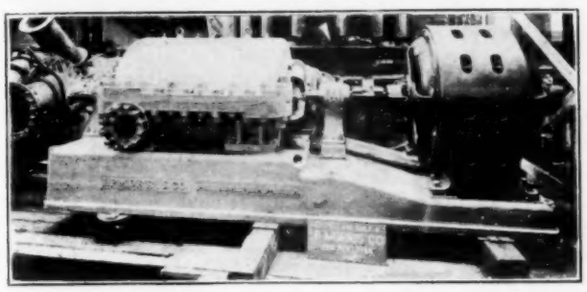
Aside from its mechanical equipment, the Cramp Brass Foundries have certain special features which are of considerable interest. In the first place only new metal is used, except of course, for the scrap produced in the foundries themselves.

The method of handling the work is different from that of the average foundry. Each molder sees his work through from start to finish. In other words he makes the mold, sets the cores, closes the mold and pours the metal. In most cases, he has to wait a little while to see the results of his work. The main reason for this method of operation is the fact that the plant has a peculiar type of work. There are few specialties which run into large steady tonnage, calling for repetitive operations which can be mechanically divided. In most cases each job is a special problem. Skilled molders are required and this type of man is often unwilling to work on mechanical jobs. An unusually large proportion of hand work is

PROPELLER FOR U. S. S. LEVIATHAN. CASTING WEIGHT, 56,000 LBS.

required because of the nature of the castings. Under this method each man is responsible for his jobs from start to finish. If the castings turn out badly the blame cannot be placed on anyone else as all the work has been done by one person. As a result, the men shoulder their responsibilities and see to it that the castings are good and the percentage of defects is very low. Many of the molders have been with the company for long periods, from 20 to 25 years, and a spirit has been built up which results in low labor turn-over and high grade work.

Every tub molder has two tubs, one for use and one for



MULTI-STAGE CENTRIFUGAL PUMP AND MOTOR

freshly cut up sand. All sand is cut up and riddled every day, the freshly cut up sand being placed in the extra tub so that the molder will always have material on hand without losing time. Four men are detailed to the job of cutting up sand, pulling out the castings and helping to pour off the day's work, but the molder is boss on his particular jobs.

Historical Facts Concerning Cramp's Brass Foundry

1885—Founded by Benjamin H. Cramp.

1886—Howard Cramp taken into partnership. Firm name changed to B. H. & H. Cramp.

1887—Courtland D. Cramp taken into partnership. Firm name changed to B. H. Cramp & Company.

1892—Entire business and plant of B. H. Cramp & Company bought by The William Cramp & Sons Ship & Engine Building Company.

Before being taken over by the shipbuilding company, B. H. Cramp & Company had manufactured among other important bronze castings the propellers for the Dynamite Cruiser Vesuvius. These were made of "Vesuvius Metal," the first manganese bronze invented, manufactured and trade marked in America. The firm also manufactured the propellers for the U. S. S. Baltimore, known as "Cruiser No. 3," among the first vessels built for the "New Navy," afterwards called the "White Squadron."

The acquisition of the B. H. Cramp Company was made for the purpose of controlling the manufacture of special alloys and compositions necessary in developing the higher types of mechanism of the modern fighting ship and commercial vessel, as well as to meet the exacting requirements of the engineers of the I. P. Morris Company, a subsidiary of the Cramp Company.

The foundry has been greatly enlarged and extended. In addition to its own discoveries and developments, a contract was made in 1894 with the Manganese Bronze & Brass Company, Limited, of Great Britain, for the exclusive use and control of their formulæ and processes in America.

This department of the company has extended its activities to cover nearly all of those fields where exactness of method and certainty of results is a desideratum. Some of its successes with all sorts of high grade castings are illustrated in this article, which also give a general idea of the varied character of its special lines of work.

WAR ACTIVITIES OF THE CRAMP BRASS FOUNDRY

Among the notable war activities of the Brass Foundry might be mentioned the following:

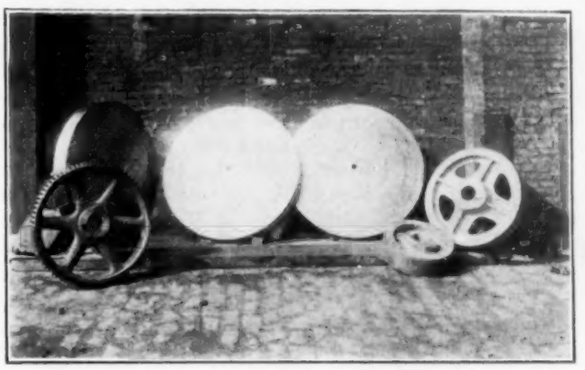
Four large stills costing over $50,000 each for the U. S. Industrial Alcohol Company to be used in the manufacture of Mustard Gas.

Two propellers for the U. S. S. Leviathan weighing 40,000 lbs. each finished weight.

Seven hundred and fifty propeller wheels for destroyers and scout cruisers, all machined complete to a true helical surface.

One hundred and twenty propellers for the Ford Eagle Boats and propellers for the S. S. Northern Pacific and the S. S. Great Northern, the latter vessel making the following record during the war:

1. Twenty trips through the war zone in war time.
2. Completed 72,000 miles in ten months.
3. World's record round trip to Europe—12 days, 1 hour, 35 minutes.
4. Beat Leviathan three hours in 3,200 mile race from Brest to Ambrose Channel on homeward leg of eighth trip.
5. Stands first in the transport service, having landed more American troops per day per 1,000 tons, than any other troop ship.
6. Completed tenth round trip 18th of November, and



PIVOT DISCS AND GEAR WHEELS FOR PANAMA CANAL

landed about 30,000 troops in France during eight months' period ending 11th of November, 1918.

7. There was no better ship in the Naval Transport.

PEACE ACTIVITIES

The peace activities are of course, much more important at this time, and they consist, as noted in the early part of this article, of work for power plants, marine installations and general industrial work.

Welding Flux

By P. W. BLAIR, Mechanical Editor

Q.—We have had a request from one of our friends who wants to know where he can find a material known as Weltex, which is a flux for welding.

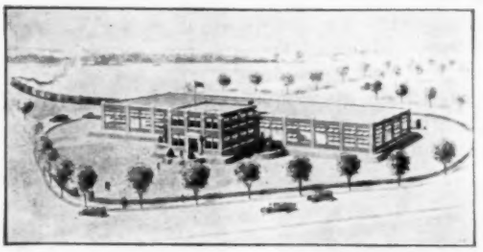
A.—We have no information with regard to the manufacturers of this brand of welding flux. There is a flux used in Canada under the trade name of Weldo but this is probably not the material you have in mind.

There are many welding compounds on the market, some of which are suited for one class of welding and some for another. The fluxes commonly used are fine clean sand and borax. When borax is used it will give better results if burned. This can be done by heating in a crucible until reduced to a liquid state. It should then be poured onto a flat surface to form a sheet. When cold, it can be easily broken up and pulverized.

New Electric Furnace Plant

A Description of the New Plant and Operations of the Ajax Electrothermic Corporation

The new plant of the Ajax Electrothermic Corporation at Ajax Park, Trenton, N. J., is now finished and in full operation. This corporation manufactures the Ajax-Northrup high frequency induction electric furnace for melting and heat treating metals, which has been described a number of times in THE METAL INDUSTRY.



NEW PLANT OF THE AJAX ELECTROTHERMIC CORPORATION, AJAX PARK, TRENTON, N. J.

The buildings consist of a one- and two-story structure; the works, 60′ x 200′—one story high; the office, 40′ x 40′—two stories high. In the office building is a private laboratory for Dr. E. F. Northrup, inventor of the furnaces, and vice-president of the corporation; a metallurgical laboratory; a demonstrating room in which furnaces in operation will be shown to visitors; drafting rooms; general offices, etc. All water is supplied to the plant from an artesian well from which it is sent by an automatic pump to a 2,500-gallon tank. The well is 110 feet deep and the pump supplies 60 gallons of water per minute at a 50-foot depth. The buildings are heated by an oil installation. Oil is stored in a 1,500 gallon tank underground. In addition to the manufacturing space, there is also a store room for raw material, crucibles, spare parts, etc.

17-LB. FURNACE SHOWING WATER COOLING

POURING MOLTEN STEEL AT 1600° C.

A ramp has been put in from the street to the floor level (which is 3 feet above the street) for running trucks directly in and out of the shipping room.

The plant consists of two departments situated at opposite ends of the building, namely, Furnace Manufacturing and Alloy Manufacturing.

Power is supplied by the Public Service Company of New Jersey, 300 KW. coming in from their line at 2,300 volts. The power equipment for the plant consists of three 100 K.W. transformers connected to deliver 440 and 220 volt power at 60 cycles, 3 phase.

HIGH-FREQUENCY INDUCTION FURNACE

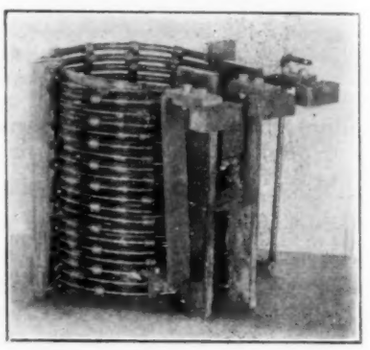
The Ajax-Northrup high frequency electric furnace consists of a crucible surrounded by a copper coil, which, having no contact with the crucible, heats the metal placed inside by electrical induction.

As the heat is generated only in the contents of the crucible, the metal is said to "melt itself," being vigorously stirred meanwhile by the electrical current flowing in it. This melting may be described as a wireless process, with a span of only an inch or two as compared with the miles of distance spanned in most wireless operations. As the Ajax-Northrup furnace shows no fire or heat while the metal is being melted, it has received the name of the "fireless, wireless" furnace.

The coil wound around the crucible in the small sized furnaces illustrated is about 6″ in diameter and 7″ high. The crucible is made of silica, at the present time by the Joseph Dixon Crucible Company.

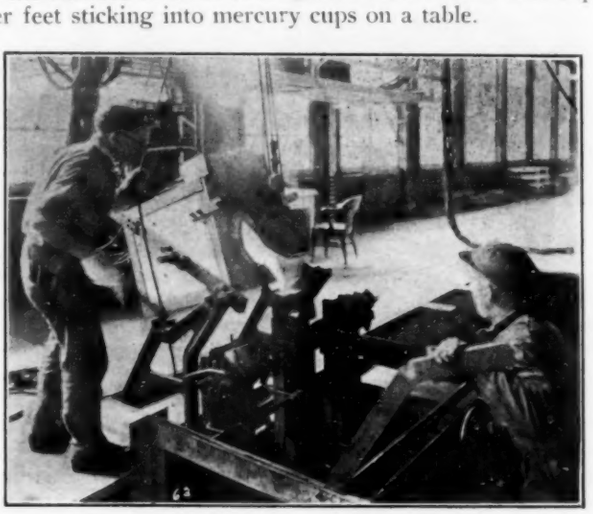
If a break out of metal occurs, it seldom attacks the coil and consequently causes little or no damage. If, however, the metal should attack the coil, it would have to be chipped out, the spoiled piece of coil cut out and a new piece soldered into place with silver solder.

This is a comparatively simple operation and offers no difficulties, although it is of course, avoided wherever possible.



COIL FOR 250-LB. FURNACE

The coil is made of copper tubing, which for the 17 lb. furnaces described herein, starts with a ½″ diameter and .030″ wall, flattened down to ⅛″-3/16″ thickness. Water circulates through it. It is separated with asbestos tape, laced back and forth and supported on the base with asbestos strip, tied to the coil with asbestos string. Inside of the coil is mica bonded in a thin sheet. Inside the mica is flint sand to fill in the space between the crucible and the mica. The top is plastered up to the mouth of the crucible with Vitrex cement, made by the Johns-Manville Company. The base of the furnace consists of an alberene stone slab with copper feet sticking into mercury cups on a table.



POURING 250-LB. FURNACE

A special nickel steel alloy is melted in a 250 lb. furnace at about 4 pounds per K.W. hour or about 500 K.W. hours per ton, starting cold. It is believed that no other furnace of similar size approaches this efficiency. With larger furnaces still better efficiencies are to be expected.

No larger steel melting furnaces of the high frequency type have been constructed to date.

A new power factor controller has been developed by Dr. Northrup for use with this furnace. It maintains the power factor of the furnace circuit at or near unity.

At the present time a shipment of furnaces with 4″ coils, for melting platinum, using a 35 KVA. converter, is being made to Moscow, Russia, presumably for re-shipment to the Ural Mountains.

Three furnaces, 15 KVA, with 2″ coils are being sent to Japan.

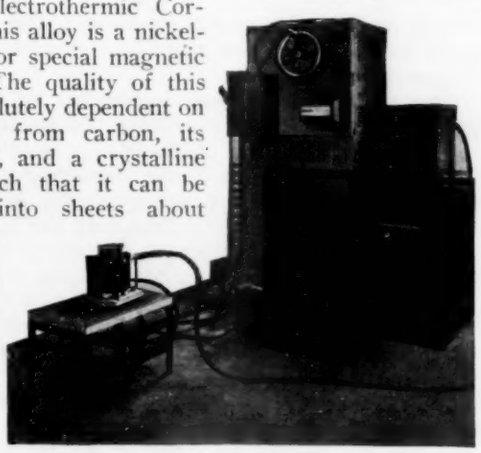
The purchasers of these furnaces are taught to keep them in repair and little or no service is afterward required from the company.

Melting Plant

The alloy melting plant, at the present time consists of 4 small furnaces and 1 large furnace. The small furnaces have a capacity of 17 pounds per heat, each, and are at

TWO 35 KV-A CONVERTERS AND FOUR 17-LB. STEEL MELTING FURNACES USED AT PLANT OF AJAX ELECTRO-THERMIC CORPORATION

the present time working 24 hours per day in 3 shifts. Each furnace is operated from a 35 KVA static converter. The metal is fed into these furnaces in the form of discs about 3″ in diameter and a ¼″ thick, and also small pieces of the various constituents. After melting, the alloy is poured into slabs. This department is shipping about 1,000 pounds per day of the special alloy made by the Ajax Electrothermic Corporation. This alloy is a nickel-steel, used for special magnetic purposes. The quality of this metal is absolutely dependent on its freedom from carbon, its homogeneity, and a crystalline structure such that it can be cold-rolled into sheets about .020″ in. thickness. This metal melts at a high temperature (over 1,300° C.).

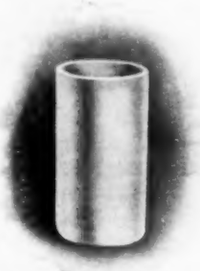


35 KV-A CONVERTER AND SMALL STEEL MELTING AJAX-NORTHRUP FURNACE

The following figures will serve as an indicator of the work of this furnace on difficult material.

With a new crucible in use it takes about 35 minutes to melt down charge of 17 pounds. Then the charge is held in the furnace for about 20 minutes before pouring. When the crucible is near the end of its life (after about 6 or 7 heats) the time of melting is cut to 20 minutes, partly because the crucible is hot and partly because it is worn away and the metal is nearer the coil.

The large furnace has a capacity of over 350 pounds. The speed of operation of this furnace is shown by the fact that pure Armco iron was melted down at the rate of 350 pounds in 57 minutes. This was in a clay graphite crucible with a clay lining. The crucible used for the special alloy is made of silica, 11″ inside diameter and 16″ deep. It is run a little over one-half full at 250 pounds. It has the silica sand, mica and other points of construction, of the small furnaces described above. The coil is made of round copper tubing.



17-LB SAND CRUCIBLE USED FOR MELTING NICKEL STEEL

An interesting device is used for tilting this furnace which consists of a power hoist, raising the furnace from its center of gravity and transferring it to a nose-tilting pivot so that the stream of metal will always strike in exactly the same spot. A strainer box is used for slab molds and this box is lined with Norton magnesia. The mold truck, which runs on roller bearings, was designed at the works of the Ajax Metal Company in Philadelphia, and is similar to that used in their works.

The furnace is energized by a 150 K.W. G. E. Company rotary generator delivering high frequency current and driven by a 440-volt 3-phase induction motor.

The switchboard for controlling the generator of the motor-generator set is placed directly behind this large furnace, for convenience in controlling operations.

The converters which operate the 17-lb. furnaces work at 26-27 K.W. while melting. When holding a melt they work at about 9-12 K.W. Temperatures are read with an optical pyrometer and then the metal is poured out of the small furnaces by hand. The furnaces are simply lifted up and tilted to pour into the slab molds. The empty furnaces weigh only 27 lbs. each. When empty they are replaced on the table.

No discomfort is experienced at or near these furnaces because of the heat, as the water circulating through the coils keeps them cold enough to touch, even immediately after pouring.

One operator alone runs two furnaces at a time. One man weighs the metallic charges and packs new crucibles in 8 hours for the three men who work the three 8-hour shifts, doing the charging, melting and casting.

The 250 lb. furnace, recently placed in operation, requires only 2 men to melt about 2,000 lbs. in eight hours.

Pure Metals

The report of the Symposium of Pure Non-Ferrous Metals, page 503, of the December, 1926, issue of The Metal Industry was in error. S. Skowronski did not show any copper with a conductivity of 106%. The conductivity of the large crystals of copper exhibited was 100.6%.

In regard to the effect of impurities in copper, it is the metals which form solid solutions with copper which have a deleterious effect on the conductivity; metals which do not alloy with copper have but little effect upon the conductivity.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 6

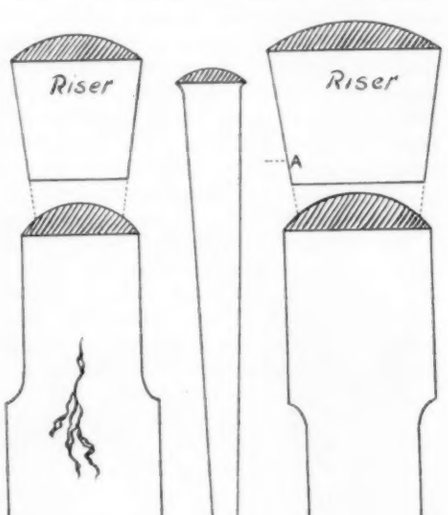
Written for The Metal Industry

By R. R. CLARKE

Foundry Superintendent

POURING TEMPERATURE

Still another factor, particularly active in the non-ferrous field and showing most prominently in copper and its various alloys is the pouring temperature. Between metal poured hot and metal poured cold, the latter will express by far the greater tendency to shrinkage and cleavage. By virtue of fluidity and greater sprue pressure hot metal will run the mold far more searchingly. In connection with hot pouring, however, it may be well to state that the mold and all cores should be prepared for the greater exaction, and that caution is ever in demand not to heat or pour the metal at those extreme temperatures where gases and oxides abundantly prevail. In speaking of hot pouring we must always be understood to be conservative.



FIGS. 19 AND 20. BOTTOM POURED METAL IN FIG. 19, AT TOP OF CASTING IS COLDER, OF SMALLER BULK AND GREATER SURFACE TO VOLUME RATIO. IT FREEZES FIRST, AND INSTEAD OF CARRYING SUPPLY TO CENTRE OF MASS, DRAWS FROM THIS CENTRE OF MASS. IN FIG. 20 THE REVERSE ORDER PREVAILS AND ASSURES A SOLID CASTING THROUGHOUT. IF WHEN METAL FROM THE MOLD RISES TO POINT A IN THE RISER (FIG. 20), THE RISER IS FILLED WITH HOTTER METAL, CONDITIONS ARE STILL MORE FAVORABLE.

In connection with hot pouring a further consideration might be noted. By the principles of oxidation, of fluidity and of buoyancy, hot metal will make more oxides and dross, carry them through smaller channels and float them more freely than colder metal. This floating tendency is a good one in that it delivers the body mass of metal free of these impurities by carrying them to the metal surface. But the casting, by means of skim gates, should be protected against excess of dross and a skim gate that will hold cold metal in check will not necessarily dominate hot metal to the same degree.

PRACTICAL APPLICATIONS

Many practical and important phases of molding work are covered by radiation, concretion, expansion, contraction and cohesion. The position of a pattern in a mold at pouring is one of these that can be studied from Figures 19 and 20.

Mold vertically and gate and pour from the bottom. That constitutes the logical order. If we mold the casting light end up, heavy end down (Fig. 19) what conditions are involved? At the finish of pouring the bottom metal is the hotter. It is also in the bulkier section. The top metal must therefore solidify first and once set can carry no feeding supply to the centre of mass further down. This mass centre must therefore set under the drains of contraction un-replenished and the casting cannot possibly be perfectly solid. But if we reverse the position, heavy end up, light end down, as in Fig. 20, then we meet the exaction of principle and need not fear results. The bottom will then solidify first, draw on the heavier bulk above, which is in turn replenished by a riser supply, and a solid casting is assured. The example suggests a very important and often overlooked principle in gating and feeding.

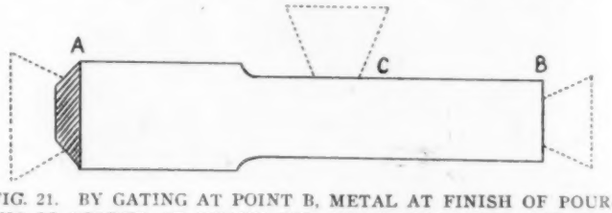


FIG. 21. BY GATING AT POINT B, METAL AT FINISH OF POURING IS COLDER AT HEAVY END THAN LIGHT END AND DIFFERENCE IN BULK BETWEEN THE TWO ENDS ADJUSTS IN CONCRETION BY DIFFERENCE IN TEMPERATURE. FOR ORDINARY PURPOSES, GATING AT LIGHT END WILL DO. BY GATING AT C, TEMPERATURES ARE EQUALIZED AT THE TWO ENDS, AND DIFFERENCE IN BULK CONSTITUTES THE SHRINKING FACTOR. BY GATING AT A, WITH PROPER AND AMPLE GATE, SUPPLY OF METAL AT HEAVY END IS HOTTER AND BULKIER AND WILL CARRY THE FEEDING SUPPLY OF THE GATE TO EVERY CONGEALING CENTRE BEYOND IT, RESULTING IN AN ASSUREDLY SOLID CASTING THROUGHOUT. A GATE THAT WILL ANSWER ON THE LIGHT END, HOWEVER, WILL NOT SUFFICE FOR C, OR THE HEAVIER END, A.

The closer the feeding supply lies to the centre of mass in any casting the better the casting.

A further study can be made in connection with Fig. 21 molded and poured in the horizontal position. We have the possibilities of gating at the heavy end, the light end or the middle. By choosing the light end, metal at pouring finish is colder at the heavy than the light end and this difference in temperature will go a long ways toward adjusting the differences in shrinkage. If we choose the middle we equalize temperature at both ends and subject the middle point of the casting to the pull of each, though at the same time, if the gate be proper and ample it will remain fluid and compensate for each. Between the light end and the middle the light end has the preference. But if we want an assuredly solid casting throughout, the decree of law favors the heavy end. But the gate used on the light end will not suffice for the heavy end. A gate pin hole or drawn cavity is a most likely consequence.

This article will be continued in a later issue.—Ed

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Electro-Deposited Thin-Walled Tubing

A Plea for the Manufacture of Thin-Walled Tube of Copper, Nickel and Other Metals by Electro-Deposition

Written for The Metal Industry
By SIDNEY CORNELL
Professional Engineer

In the aim for quality at lower cost of metal articles, consideration has been given to thin walled materials made by electro-deposition. Unfortunately few have gone through to a conclusion with this matter. Seamless tubing is available in the various metals, but thin walled material is not on the market. It is a costly and mechanically difficult operation to draw tubing below the gauges commonly listed, and naturally as the diameter of such tubing increases so does the wall thickness that is available commercially. In turn, even with those gauges available, the extras added to the base price make thin walled tubing a far too costly material to use very often.

Electrodeposition is naturally well adapted for producing thin sheets of copper or other metals, seamless tubes or shaped articles. The thinner the sheet or tube, the less the cost, whereas in mechanical production, the thinner the gauge the greater the cost. This subject is often dubbed an Inventor's Dream. The attitude has been "Let the other fellow do it," hoping for the time when thin walled seamless tube, formed articles or sheet would be the product offered by a single interest. With such material, surface rather than weight would be sold, and the sale of metals on a square foot basis rather than on poundage would obviously be a radical departure.

LIMITS OF DRAWN TUBING

The following table is of interest to any that have given the matter of electrodeposition serious consideration as a source of supply of raw material for manufacturing purposes. It illustrates the limit of thinness possible commercially for drawn brass tubing, as offered by the brass tubing people:

Outside Diameter	Stubbs Gauge	Thickness in Inches
1".	27.	.016
1½".	27.	.016
2".	26.	.018
2½".	25.	.020
3".	23.	.025
3¾".	23.	.025
4".	22.	.028
5½".	21.	.032
7.	19.	.042
9.	16.	.065
10.	13.	.095

EARLY MISTAKES

During the heyday of the phonograph the tone arm was pointed out as a fine piece to make by electrodeposition. Thousands of dollars were lost in doing so, but certain knowledge was acquired. Wax forms were made use of, but it has been conclusively proved that wax and oils must be kept out of electrodepositing baths to prevent pits, nodules or "trees." Rose metal, lead, or low melting alloys used as a form base, and melting out of this core is a make-shift means of a past age, but many experimenters turn to this means, even in this enlightened day. Few platers have seen fit to examine metallic powders under the microscope to see how a lacquer pigment may be to start with, and many may be surprised to know that a number of bronze lacquers are simply "shot," not "flake" or powder. Old style tricks of the trade like the copper deposit placed on cast iron prior to soldering it, is not electrochemistry as understood today. In short the production of electrodeposited articles, sheet, tube or formed, is not commercially possible by "shop tricks," but is only by use of knowledge and skill of the electrochemist. Unfortunately the electrochemist is not a business man, and business-wise the situation today is that electrodeposited formed articles do not by themselves alone constitute a line of articles around which it is possible to build a business. There is no basic patent involved, and any patents on the subject would be of extremely doubtful value. Hence any interests that can use thin walled material that can be formed by electro deposition are at liberty to make use of the art to its fullest extent.

ARTICLES THAT CAN BE MADE BY ELECTRODEPOSITION

Tone arms, jimmy bends, soda fountain draft arms, vacuum sweeper noses, tea pot and percolator spouts, and all such intricate shapes can be made cheaply and well by electrodeposit. Thin walled tubing for radiators, electric refrigerator parts, thermostatic bellows, pencil parts, eraser holders, lamp sockets and the line that might be classed as hollow ware can be made to great advantage by this means. Thin sheets, especially if semi-shaped, like engine head gaskets, flat gaskets of all descriptions, reflector bowls, floats for traps and such mechanisms can be made by such methods.

Assertion that it can be done is not enough. The situation is simply one that it is being done. But while it is being done in various shops in the country it is simply to supply local requirements, and the nature of the art is such that it will not be possible to build a business around it exclusively. Some people are turning out electrodeposited articles that are not worthy of the name, the most notable example being lamp reflectors. Others, notably the Reliance Gauge Column Co., manufacture floats for their boiler gauge column that are seamless, homogeneous, smooth and attractive, made of nickel, and are in operation under 1,200 pounds boiler pressure. Such floats have been tested to 3,000 pounds pressure. Floats made by electrodeposition are in use in steam traps, toilets, on all manner of control mechanisms from carbonators on soda fountains to gauge columns in power plants. The floats have walls ranging from .018 inch for toilet floats, of copper, up to ⅛ inch of nickel, used for high boiler pressures.

The thermostatic bellows is an outstanding example of a material consuming large quantities of thin walled tubing. This Chinese-lantern-like affair of seamless metal presents no limitations. The use as a check to the water in the automobile engine, in valves of the packless type, in displacement pumps, even in overflows for liquids, like oil cooled transformers, with return of displaced liquid on cooling, is simply a question of availability and cost. At reasonable cost this bellows would be used in place of the Bourdon tube in all types of gauges. Thin walled tubing alone is responsible for the high cost of bellows. In blanking from flat stock and drawing a short length,

two reductions of cup, and four draws are necessary. Interposed between operations is an annealing and pickling operation; hence 18 operations are required to produce a thin walled tube mechanically. The scrap loss is severe, as is always the case by such a method; 60 per cent by weight.

In the manufacture of such an article as a thermostatic bellows the sizes range from 1 inch diameter up to 8 inch diameter. Many will wonder why such thin walled material is necessary. This is because a wall of .007 inches will stand innumerable flexes without cracking or failure. Thicker walls will break down. On a 1 inch bellows for example .007 inch is satisfactory, but .012 inch wall is not; a premature failure occurs. On an 8 inch bellows .012 inch wall is satisfactory and any thicker is unsatisfactory. Naturally, by electrodeposition this thin walled material can be easily produced.

Large diameter thin walled tubing has been produced in this country for 10 years, but never utilized as such. The Edison Storage Battery Company uses nickel flake in their cell, to produce which they electroplate .001 inch copper on a cast iron drum, properly rotated in an acid bath. This drum, a unit of multiple arrangement is transferred to a nickel bath and .001 inch nickel deposited. The operation is repeated, and a bi-metallic tube produced, with possibly 100 layers of the two metals. Tubing is not wanted and the formed tube is stripped or slit from the mandrel, although many have come off without the slitting, and the deposit hashed up into small squares, approximately ⅛ inch square; the copper dissolved out, in mixed sulphuric and hydrochloric acid, leaving nickel flake. This is nothing new, as it has been done before the War.

One French plant is producing approximately 4 tons of various sizes of thin walled tubing per day, the sizes ranging from ½ inch to 30 inches in diameter. In order to give a smooth surface to this product an agate is moved constantly by mechanical means over the surface plated, a modified burnishing effect being obtained.

Innumerable manufacturing concerns have tried at various times electrodepositing to get by a troublesome operation or series of operations. At this writing two very well known concerns, noted for their products, but likewise noted for their absurd limitations on employes, have announced that their attempts at electrodeposit are failures. One attempted to plate over a soldered copper tube assembly; another attempted to make thin copper sheet by electrodeposition. Their cases are their own fault for others are doing far more difficult work than theirs by electro deposition and producing commercially.

IMPORTANT FEATURES OF THIN WALLED TUBING PRODUCTION BY ELECTRODEPOSITION

Only a very rough attempt to standardize tube production by electrodeposit can be made in this article, but the attempt may prove useful. If a 30 inch tube of say .015 inch wall is made this becomes a sheet if slit. In turn, if formed articles are needed the same standardization with necessary modifications will apply.

The factors necessary to standardize for thin walled tubing production are as follows:

1. The composition and properties of the anodes. On copper and iron this is of lesser consideration; on nickel it is important.
2. The composition of the bath or electrolyte. Simplicity and control are of the utmost importance.
3. The temperature of the bath; control readily effected, but far too often neglected.
4. Current density; as important as the critical temperatures in steel treatment, but juggled frightfully. A wide range of effects can be brought about by this factor alone.
5. Agitation—the most important factor involved. Air, paddles, and slow motion or flow are not the only elements. Rotation in this art has a similar effect to grinding work in which wheel and work are both rotated. In grinding grain depth of cut has been explained. The faster the grinding wheel the greater the cut, and the faster the work the higher the finish. A similar occurrence takes place in the plating bath, viz., the faster the electrolyte the finer the grain, and the faster the work the finer the finish.
6. Control of hydrogen (i.e., gases); effected on copper and iron by rotation of work; in nickel by rotation and the composition of the anodes and solution.
7. The cathode surface and condition. In form work, tube and sheet, adherence is not at a premium. A granular burnt-on base is not good practice. The use of non-adhesives like silver iodide, selenium compounds, etc., remains to be studied. Grease and oils are detrimental to performance. A polished surface produces accordingly; a composition like paper, lacquered, naturally produces that texture. The reverse of a surface as required for plating is needed, and such requires special means.

SOLUTIONS

The ideas of what constitutes the best copper bath or the best nickel bath are legion. In short, from a standardization standpoint this seemingly highly important element is immaterial. The maintenance of a selected composition at constant strength is of the greater importance. Acid baths for high production are naturally selected: 15 to 25 per cent copper sulphate, and from 1 to 10 per cent sulphuric acid is the old standby acid copper. Complete knowledge of the solubilities of copper in acid solution, the effects of temperature, upper and lower limits, are at hand but not used as intelligently as they might be. For operation at 90° F., a bath of 30 ounces per gallon of copper sulphate with 10 ounces per gallon of sulphuric acid may be taken as representative.

For nickel tube, either the sulphate of chloride bath will produce deposits. The production of malleable nickel is now common knowledge. For the sulphate, 10 ounces per gallon of nickel sulphate, 2 ounces per gallon boric acid, 2 ounces per gallon of ammonium chloride and 20 ounces per gallon of sodium sulphate may be taken as representative.

Colloids represented by glue, organics by sugar, and inorganics by alum, and representative of hundreds of "Dopes" or additions to baths in general, must be avoided. Harder, denser and more brittle deposits result from their use but only slight current economy is obtained.

While various additions tend to effect the rate of deposition, and on nickel especially the use of sodium sulphate is marked, rapid rotation is more effective. Thus additions in general tend to complicate the situation without corresponding benefits.

It is not only desirable to keep a bath in a fixed condition chemically, but it is positively necessary to keep it clean. This means continuous filtration. Besides the number of filters offered for this service there are two porous materials on the market of great merit, acid proof, of several ranges of porosity, very cheap, being $2 per square foot, and obtainable in slabs 2 feet square and 1 inch thick. It is easy to provide a filter chamber in all tanks with this material, and there is no excuse for a dirty tank. Obviously in making tubes and similar materials a homogeneous material only is satisfactory, and a dirty electrolyte can produce only dirty tubing.

THE CATHODE

The condition of the cathode is of fundamental importance. Many have deposited the required thickness of metal upon a mandrel, and then found it impossible to remove the mandrel. This has probably discouraged many in their attempts at making thin walled tubing by this means. Any of the following methods are satisfactory.

Paper cores, often called "mailing tubes," are cheap and obtainable in all diameters from ½ inch up to 8 inches or larger, and in any length up to 20 feet, the limit only being what can be conveniently handled. The machines for their manufacture are standard. Such cores are mounted on common steel pipe mandrels, the ends sealed with shellac, and coated effectively by several means. The ordinary bronzing produces a good tube, but not as satisfactory as is possible, for the drying out is low, and the coating at best thin, so that the spiral groove in the mailing tube is duplicated in the product. This does no harm for many purposes, for others it is objectionable. By means of the spray gun a metallic layer is imposed upon such a tube, and the groove is filled up, a much better tube resulting. By using a tin lacquer which is quick-drying, a smooth surface can readily be obtained, tin as a powder differing from all others in that it is a true powder, whereas copper, etc., may be in flake form.

Paper cores are used as the base for boiler column floats, are possibly the outstanding example of a worthy and commendable electrodeposited product. The test of time has proved their merit. There are several moulding machines on the market for the make up of papier maché forms, use being made of a Monel metal screen mould to which wet paper will not adhere and a paper pulp blown into these moulds by steam. The steam drives out the water through the meshes of the screen, dries the paper form, and rapid and cheap production results. It is a simple matter to make such cores for percolater spouts, tone arms, etc., although naturally, special moulds are required for each shape. Such paper forms may be coated by any of the methods described above, mounted on proper holding spindles and rotated either vertically or horizontally. In intricate shapes, some attention must be given to throwing power of the bath.

Extruded lead tubing is obtainable, large quantities being used as collapsible tubes, and this is a handy form for limited quantities of thin walled tubing of copper or nickel. The lead tube is placed upon a brass pipe mandrel, and the ends sealed with shellac, lacquer or rubber sleeves to prevent plating at undesirable points. Compressed air can be used to blow out the lead tubes, and placement on a mandrel thereby facilitated.

Polished brass pipe mandrels, or stainless steel mandrels produce tubes that are satisfactory for every purpose. No unusual precautions are necessary for preventing adherence, and no unusual methods are necessary for making a deposit stick. However, a slight oxidation of a polished brass mandrel either by running a flame over it or by dipping, seems to aid materially in the removal of the tube from the mandrel. Coating of steel mandrels with tin lacquer gives a tube that is easily removable, but continued use would give pitted mandrels that would not produce removable work. To remove such tubes, especially in the smaller sizes, the handiest device is a large sized three roll pipe cutter, with the rolls flat faced. The mandrels are placed in a lathe and rotated with this tube remover run over the surface at various points, but beginning in the center and not on the ends and stretching the deposited tube enough to pull out the mandrel. Such a method requires labor, and is limited accordingly. A semi-automatic means is the use of a swaging machine, having flat and not tapered dies. A cushioned die works best, the blow being absorbed by the outer surface of the tube and a run through a swager is an effective means of tube removal. This is simply intensified hammering of the tube, stretching same and permitting of removal, and works best on a hard mandrel like stainless steel.

The removal of paper cores requires boiling in water to pulp out the paper. Tubes subjected to steam, either wet or superheated, are not as readily removable and probably the cost is greater. Burning out of the paper is not practical, especially if the lacquer has not completely dried, and the paper wall is too thick, for with thin wall material, the gases produced may work through the metal rather than through the paper. Such boiling out can of course be done in vats.

EQUIPMENT REQUIRED

For production purposes, 12 foot tanks, 4 feet wide, and approximately 12 inches deep could be mounted in tiers, say five high, each tank to hold 5 mandrels 10 feet long, for sizes 1 inch up to 3 inch tubes. Naturally for 30 inch tubes deeper tanks would be required. The driving or rotating mechanism must be of composition non-plating gears, with the proper cathode contacts. The amperage possible per square foot will depend largely upon the mandrel construction, the solid metallic being best in this respect, rather than the paper coated.

At 50 amperes per square foot a tube 2 inches in diameter and with .008 inch or .009 inch walls will be produced in four hours, or two per day of 8 hours. A 5 mandrel tank produces accordingly 10 tubes, 10 feet long, and weighing approximately 2 lbs. per tube. These figures are for copper. For nickel, it is slower, and very probably somewhat thicker walls would be desired.

To make such a method as nearly automatic as possible an ampere hour meter calibrated for thickness of deposit could be used, with automatic cut-out of current when the desired wall thickness was obtained.

The generator is of important consideration and a ten tank tube plant similar to the above, productive of 3000 feet of tubes per day would require a 30-45 Volt, 1600 ampere machine. The entire equipment would come to less than $10,000, and compared to a possible mechanical press shop of equal production, were that possible on such thin material, it would be considerably less than half the investment. A saving of 50 per cent in equipment and 50 per cent in material is something to be considered.

Thin walled tubes of iron, copper and nickel ranging in wall from .007 inch to .016 inch, and from ¾ inch up to 2 inches in diameter, when annealed, have been flanged, spun and drawn and the electrodeposited tubes are superior in their working to the rolled product. It is necessary in the anneal of this material to use only ordinary precautions. Copper annealed at 1150 to 1200° F. in a reducing atmosphere for 3 or 4 minutes is satisfactory. Nickel requires 1450° F., and iron about 1500° F. Being thin walled it is easy to burn the material. Probably the safest method of annealing is in a molten salt bath, kept at constant annealing temperature. The material is so light that no rise and fall of a bath in temperature due to immersion of work occurs.

Many shops in this country desire thin wall material, and are simply waiting for some one to put it on the market. No one can, for the weights involved are too small, as stated. When it is known that a number of concerns are doing this work successfully for their own use, when it is known that the equipment cost is remarkably low compared to machine tools, etc., the hesitation of manufacturers to make their own tubing in their own shops by this means is hard to understand. The only excuse is unfamiliarity.

It is hoped that this article will arouse interest in this method, and that many who have made such tubes will see fit to contribute similar articles on the subject.

Candlesticks of Silver

A Brief History of the Artistic Development of This Useful Article of Family Plate

Written for The Metal Industry

By A. F. SAUNDERS

Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

A. F. SAUNDERS

The candlestick is the candle bearer of the Middle Ages, the Renaissance and of modern times and although the flicker of the candle may appear to have faded before the glare of electric illumination, the fact is just the reverse, as there are many times more candles and candlesticks made and used in this modern electric age than were ever dreamed of in the olden days when people depended solely upon candle light. So potent is the irresistible charm of the waxen taper, so becoming is its soft glowing radiance that modern science has thus far been powerless to exile the old fashioned candle and its holder from its stronghold upon the family dining table, the library fireplace or its firmly established place upon the altar of the church.

The origin of the candle is lost in the shades of antiquity, its holder was a natural and logical development and it seems safe to say that there is no form familiar to the world of antique silver, under which category has been produced such pleasing shapes and decorative treatment as that of the candlestick, which by the beginning of the 18th Century had become an article of general domestic use and often of such massive proportions as to place it among the largest and most costly pieces of the family plate. The artistic talent and skill of the very best metal craftsmen of the past three hundred years has been called into play in the making of this useful article.

In the middle ages and up to the time of the Restoration, 1660-1684, the usual method of holding the candle in place was by means of a conical spike or "pricket," one of the finest and perhaps earliest examples of this curious type of candle holder is the "Gloucester" candlestick, a part of the very interesting collection of old silver in the Victoria and Albert Museum of London. In design this rare old antique is more unique than beautiful, but its workmanship is of the finest and is worthy of a brief description. Made of a white alloy, which, from its color and character, is supposed to consist largely of silver, the entire body of the candlestick including the base is a mass of intricate ornamentation in bold relief. The design includes dragons, griffins and other mythical figures, both men and animals, the whole interlaced with pierced leaf and stalk work. Around the top of the drip or grease cup is a Latin inscription telling how the candlestick was presented by

FIG. 1. THE "GLOUCESTER CANDLESTICK" OF THE 12TH CENTURY MAKE, ONE OF THE OLDEST SILVER CANDLESTICKS IN EXISTENCE. FIG. 2. AN EARLY 18TH CENTURY CANDLESTICK OF CHASED SILVER, MADE IN FRANCE WHEN LOUIS XIV WAS "LE GRANDE MONARQUE." FIG. 3. SILVER CANDLESTICKS OF THE SAME DATE AS FIG. 2, BUT OF ENGLISH MAKE, IN THE DAYS OF QUEEN ANNE. FIG. 4. A HANDSOME CHASED "GEORGIAN PERIOD" CANDLESTICK OF SHEFFIELD PLATE, MADE IN SHEFFIELD ABOUT 1780. FIG. 5. SILVER CANDLESTICK OF ENGLISH MAKE, CHASED IN A FLUTED DESIGN OF GEORGE THE FOURTH'S TIME. FIG. 6. A TYPICAL AMERICAN COLONIAL CANDLESTICK OF SILVER MADE IN 1722. FIG. 7. AN ALTAR CANDLESTICK, SPUN IN SILVER AND OF MODERN MAKE. FIG. 8. STERLING SILVER SPUN CANDLESTICK OF MODERN MAKE, DECORATED WITH HAND ENGRAVING.

Abbot Peter to the Abbey Church of St. Peter at Gloucester, England, sometime during the early part of the 12th Century. From base to the top of the drip cup it measures twenty-tree inches and the base is over eight inches in diameter and supported by three chimera. This candlestick is conceded to be one of the very choicest examples of the metal-smith's art of the middle ages.

Illustrations of old English plate show them to have had cylindrical tubes or sockets for holding the candle and this is the style of holder that has been in general use for household purposes for the last three centuries. The earliest examples of the socketed type had a projecting ring near the middle of the stem. This served the double purpose of catching the candle drip and insuring a firm hand hold upon the stick when moved about. The base was usually circular in form though square and octagonal bases were not uncommon.

In the days of Queen Anne, 1702-1714, candlesticks of silver had come into general use, at least in the homes of the wealthy. Those of the humbler classes were made of brass, pewter or other cheaper materials. The earlier examples of this period rarely exceeded 10 inches in height and in design were simple in shape and with but little if any decoration on their baluster stems and bases. The saucer-shaped drip plate at the top had now come into use. Under King George II, 1727-1760, much taller styles became the vogue. Huge candelabra with movable branches of three, five, six and even twelve lights were not unusual and examples of this middle Georgian period show a more ornate treatment in both shape and ornamentation. Many of the most beautiful candlesticks of this time were copied from the fluted Corinthian column, sometimes, though not always, with the capital and base of that classic order. This columnar pattern, however, while graceful in itself, does not prove so satisfactory when in actual use, as its tall straight lines appear overdone when further extended by those of the tapering candle. During the last quarter of the 18th Century the round column gave way to the rectangular shaped stem with decorations of festoons, leaves, vines and medallions in the Adam style, then at its height of popularity. Some of the most beautiful designs in silver were the work of Paul Lamerie.

With the advent of Sheffield Plate, many beautiful candlesticks were made by this process. In design they of course following closely those made in solid silver.

In Italy and France, candlesticks were designed and executed upon even a grander scale than in England. Especially was this true of the hugh gold and silver gilt candelabrum designed for the great cathedrals of Italy. One of the choicest pieces among the treasures of the Vatican is a superbly chased gold candelabrum, the work of Cellini, celebrated 16th Century master craftsman. The church of St. Andrea della Valle, Rome, possesses a pair in silver gilt that are masterpieces of the 16th century Italian goldsmiths' work. Standing over four feet in height, these candelabrum are superb examples of the fine art of casting, chasing and carving.

Several beautifully designed silver candlesticks of more modest dimensions may be seen among the art treasures of the Louvre, Paris. These masterpieces of the silversmiths' art are the work of Charles Le Brun, master craftsman and court art director under Louis XIV, 1643-1715. Fig. 2 illustrates a beautiful silver candlestick of 1714 French craftsmanship. It may be easily noted that contemporary metal work in England followed along simpler lines, and pleasing proportions, rather than elaborate ornamentation.

About the middle of the 16th Century casting in the precious metals had been brought to a high state of perfection, largely through the efforts of the master goldsmith Cellini. But aside from the great candelabra made for church use, practically all household candlesticks in silver were hand made, the several parts such as the base, stem and drip cup being hammered entirely by hand out of sheet metal. All ornamentation was chased in respoussé, line chasing, or hand engraved, though in rare cases the base was turned from solid metal and decorated in hand carving. All bases made from sheet metal had to be weighted, usually a filling of lead or pitch being used to give stability and weight to the bottom of the stick.

The low saucer type of chamber candlestick came into use during the time of James II, 1685-1689 and they continued in vogue up to the beginning of the 19th century. The thick soft wicks of olden time candles necessitated

FIG. 9. A NINE BRANCHED CANDELABRUM IN SILVER GILT OF FRENCH WORKMANSHIP, LATE 18TH CENTURY.
FIG. 10. ONE OF A PAIR OF SILVER GILT CANDELABRA PRESENTED TO THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK CITY, BY THE LATE GOVERNOR LEVI P. MORTON.
FIG. 11. SILVER CANDELABRA, PART OF A SILVER SERVICE MADE FOR EMPEROR NAPOLEON IN 1815.

the use of those curious looking scissors shaped affairs, with a little box projecting from one side and called Snuffers. These were used to remove the charred wick ends and a small tray or stand with a conical extinguisher completed a candle set for bed room service.

In Colonial days, the candlestick was one of the most important articles of household use and next to spoons, there were perhaps a greater number of candlesticks made than of any other article of silverware. Here too, the best of artistic taste and skillful craftsmanship was nowhere more in evidence than in the graceful candlesticks made by these masters of early American silversmithing.

Candlesticks are still an important item in the line of the modern manufacturing silversmith, but very few of them are hand made, (at least in the old sense). Practically all of the candlesticks seen in the shops today, whether of Sterling or plated ware, are either spun, stamped or cast in soft metal, though many of the spun sticks are often handsomely decorated in hand chasing or engraving.

Waste and the Metal Trades

How Industry and the Government Are Cooperating to Reduce Wastes

Written for The Metal Industry

By W. E. BRAITHWAITE

Division of Simplified Practice, U. S. Department of Commerce

In 1921, a committee of seventeen prominent engineers was appointed by Herbert Hoover, while President of the Federated American Engineering Societies, to make an extensive study of the causes of waste then prevalent in American industry. The results of this investigation (which was the first cooperative effort to analyze the causes of waste and make constructive suggestions for its reduction and elimination), attracted wide attention.

The publication of this report served to direct the attention of a large number of business executives and the general public, to the extravagant, needless losses and wastes existing in American business and detailed the wastes occurring through lack of rational standardization of methods, practices, policies and designs. The committee made an "assay" of waste in six major industries and found varying degrees of waste, as follows: metal trades 29%; boot and shoe manufacturing 41%; textile manufacturing 49%; building 53%; printing 58%; men's clothing 64%; an average waste of 49%.

The general movement throughout the country for elimination of waste in production and distribution has since made steady progress. Under the able leadership of Secretary Hoover, the Department of Commerce, in continuation of its work of the past five years, has devoted much of its activities to this end. Realizing that one of the major attacks upon industrial waste lies in simplification and standardization, Secretary Hoover established during the latter part of 1921, the Division of Simplified Practice, to serve as a centralizing agency or clearing house in bringing producers, distributors, and users together and to support the recommendations of these interests when they shall mutually agree upon simplifications of benefit to all concerned.

This Division has been actively engaged in directing the national effort toward the elimination of waste in manufacture and distribution through the reduction of excessive varieties in shapes, sizes, quality, processes, etc., of manufactured products.

The economic savings resulting from the adoption of standards and simplifications are enormous and the cooperative efforts of the Department along this line have met with phenomenal success.

In nineteen different lines which have already adopted simplified practice recommendations, the average adherence is seventy-nine (79) per cent. In other words, an average of practically four-fifths of last year's output in these lines conformed to the sizes, dimensions, etc., in the simplification programs arrived at through joint conference of representative manufacturers, distributors, and consumers concerned. Based on figures taken from the re-surveys made by the Standing Committees responsible for the success of the simplification programs in their respective fields, the following adherence to the simplified practice recommendations developed within the non-ferrous metal trades will be of interest:

Commodity	Reduction in varieties — From	To	Per cent Reduction
Brass lavatory and sink traps	1114	72	94%
Sterling silver flatware	190	62	67%
Valves and fittings (adopted in connection with simplification of wrought iron and wrought steep pipe sizes, including brass valves and fittings)	20000	19238	4

Since 1921 a large number of cooperating committees have been set up in various industries and trades to cooperate and work in conjunction with the Department of Commerce. As a result of the experience gained by these committees, the metal using industries proposed to Secretary Hoover that there be organized a special committee to develop programs for the elimination of waste in their field.

On May 13, 1926, The National Committee on Metals Utilization, composed of representatives of the manufacturers, professional societies, trade associations, etc., was established. This committee is an impartial body made up of all branches of industry and trade interested in closer metal utilization, better manufacturing, and distributing, as well as metal-using practices. It is the purpose of the committee to carry the principles of simplified practice more deeply into the metals-using field. Unification of specifications and the discontinuance of certain undesirable trade practices are also included in the scope of the work.

A permanent staff located in the Department of Commerce conveniently near the facilities of the Division of Simplified Practice and other governmental services, is in a position to co-ordinate the ideas and purposes in the minds of manufacturers, distributors, and users in a particular industry, and to act as a clearing house in bringing together the various elements in several industries that share the same problem.

As said before, this committee is concerned not only with simplification and standardization but with the subjects of unification of specifications and trade practices as well. Representatives of a large number of industries in the non-ferrous field and allied groups have already either consulted or communicated with the members of the committee regarding certain phases of waste and their elimination. In order that the reader might have some idea of the services offered by the National Committee and the problems submitted to it for consideration, a few cases by way of illustration will be mentioned.

For instance, the Sterling Silversmiths' Guild of America has consulted the Committee in regard to assisting the industry in problems where cooperative action would be of value, such as hall-marking of sterling silver tableware.

The Director has been requested by the foundrymen to cooperate in furthering the elimination of duplication of effort, unreliable data and guess-work in bidding, by giving attention to the proposition that approximate weights of castings be indicated on blueprints and inquiry forms sent to foundries for estimate. A meeting was held in Detroit in September to consider the replies to questionnaire sent out by the Committee requesting comments and suggestions as to the feasibility of this proposition. Nearly all the answers were in favor of the plan. A few were opposed to the idea. A sub-committee of five members was appointed at that meeting to prepare a suggested standard quotation form which is to be submitted to the foundry industry in general.

A manufacturer of brass caulking ferrules has suggested the desirability of applying simplified practice to that commodity. The matter is being held in abeyance until further progress is made in connection with the simplification of trap screw ferrules. This action was

deemed advisable inasmuch as any simplification program in connection with these two commodities involve the question of both state and municipal codes. As soon as a recommendation has been developed for trap screw ferrules, action will be taken in an effort to reduce the excessive varieties of brass caulking ferrules.

On December 2nd, manufacturers of metal spools and reels, representing approximately ninety per cent of the annual production of these commodities, convened at the Department of Commerce, under the auspices of the National Committee on Metals Utilization, for the purpose of considering the possibilities of applying the principles of simplified practice to their products. In contemplating what the scope of their first application of simplification should be, the conferees constituted themselves a committee of the whole, to conduct a survey of the present conditions in the industry as a first step in the direction of framing a tentative simplified practice recommendation. This survey is for the purpose of ascertaining the major production and demand of metal take-off reels, metal reels for handling welding wire and metal spools for handling and shipping bare wire up to 50 pounds. The Simplified Practice Committee selected January 15, 1927, as a tentative date for the chairman to report on the results of this survey.

As Secretary Hoover has said—"The saving in national effort through such cooperation, as demonstrated by many well-known examples of simplification and standardization, runs into many millions of dollars. There is a great area still untouched in which the application of these waste eliminating measures may well save not millions but billions. The consequent reduction of manufacturing, selling, and distribution costs, and the release, for active use, of millions now tied up in slow moving stocks, combine to yield savings eventually reaching the consumer in lower prices, thus assisting him to a higher standard of living. Our advance will be in proportion to the extent which we all cooperate for the elimination of waste."

Spongy Brass Casting

Written for The Metal Industry by W. J. REARDON, Foundry Editor

Q—Under separate cover we are mailing you a sample of a plate that we are casting in quantities, and have considerable difficulty with defects near the gate in the form of spongy holes that resembles slag. These castings are sand blasted and sometimes the holes do not show until after sanding. Part of the sample is sanded to illustrate. Also please note the small cracks.

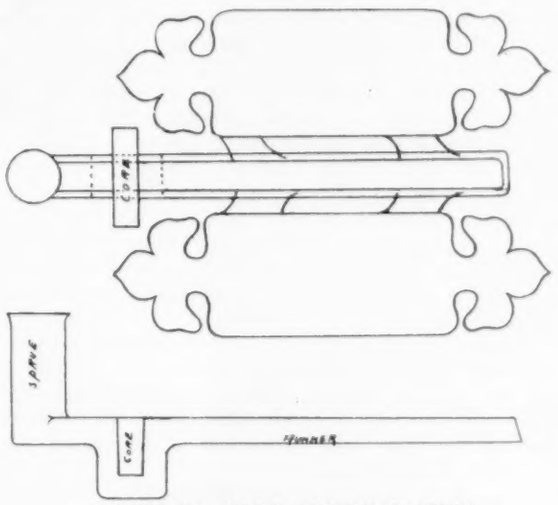
We have sent the casting attached to the gate so that you can see how it is gated. Some are poured in the drag and some in the cope. Until recently we seemed to be getting better castings by pouring in the cope. The casting is marked on the back which way it was poured, as is also the mixture. While we generally use an ingot that is supposed to be pure clippings of a 70-30 mixture, we have also tried mixing new metals, but with no apparent improvement, except that with a mixture of 76 Copper, 19 Zinc, 4 Tin, and 1 Lead, plus 2 ounces of Aluminum, we eliminated the cracks, and got a fair casting. But the lead showed blue streaks through, clear through the casting, which would show after finishing. By leaving out the lead we got a good color, but excessive cracks or checks as may be seen on the sample.

The castings will not run without the aluminum. We have tried many kinds of flux, advertised brands, without benefit. We put about one pound of borax in each pot when charged, and have added rock salt before and after pulling pot.

A—On examination of the sample casting we find your trouble is caused by dross in the metal, which is caused by the action of aluminum. The way to overcome this difficulty is to have the metal enter the mold as quietly as possible. If not, the metal foams like soap-suds and causes this dross. One way to overcome this difficulty is to give the metal as long a run as possible before entering the mold. In your case the dross appears to be close to the pouring gate and we suggest a skim gate be used similar to sketch.

Pour the casting in the drag, but lay another runner on top of your present gate in the cope. This should eliminated your trouble due to dross.

However, if you wish to use a metal free from aluminum we suggest you try dusting the mold with powdered rosin, dusted on the mold through a very fine parting bag. Leave the mold open until just before time to pour and then apply a torch and burn the rosin on the mold, brown. This will give your mold a nice skin and yellow brass such as you are using will run sharp and clean, and should give you a very desirable casting.



GATING TO AVOID SPONGY CASTING

Die Casting Alloys

Written for The Metal Industry by JESSE L. JONES, Metallurgical Editor

Q—Is there a recognized list of aluminum die-casting alloys? What are the standard mixtures? I know of the No. 12 Alloy, (Al 92, Cu 8) and the silicon alloy (Al 92, Cu 4, Si 4), but are there any others?

A—Sub-Committee VIII. of Committee B-2, American Society for Testing Materials, has finally decided to compile a list of the aluminum die-casting alloys which are in use at the present time and to attempt to ascertain their physical characteristics. This, you will realize, is a rather large subject and it will require the adoption of standard test pieces, making of dies for same and the obtaining data on the physical characteristics of quite a number of alloys, which will be a rather long and expensive undertaking. We shall be glad to keep you informed as to the progress of this work, but it will be some length of time before any one will be in a position to give specific information.

Chromium Plating

Contributed by the Machine Shop Practice Division for Presentation at the Annual Meeting, New York, December 6 to 9, 1926, of The American Society of Mechanical Engineers, 29 West 39th Street, New York

By DR. WILLIAM BLUM
Chemist, U. S. Bureau of Standards, Washington, D. C.

Judged by the interest displayed and the publicity attached to this subject, chromium plating might well be called the "sensation" of the last few years in the field of protective coatings, a field in which there have been but few other radical changes in the last decade. Among questions that are no doubt now in your minds, and in those of many chemists and engineers, are "What is the future of chromium plating?" "Is it a practical process?" "What is its probable value when applied to engineering materials?" In short, can we use it?

DR. WILLIAM BLUM

In this informal talk I will attempt to answer or at least to discuss some of these questions, especially from the standpoint of the mechanical engineer. In doing so I am limited principally to the experience and contact of the Bureau of Standards, because so little authentic information has been published on this subject, especially in this country. As, however, a large number of industrial research laboratories are now engaged in the study of chromium plating, and hundreds of firms are trying it out for various purposes, it will no doubt be possible within a few years to make much more definite statements than are now justified.

In order for any new process or product to compete permanently with the established procedure, it must have certain definite advantages. It may therefore be well, before discussing methods and applications of chromium plating, to consider those properties of the metal which make it of special interest.

The outstanding property of chromium, when deposited under appropriate conditions, is its extreme hardness, as measured for example by its resistance to scratching. A bright chromium deposit, when tested in the Bierbaum apparatus with a sapphire point and a given load yielded a scratch with a width of about 0.7 micron, (the narrowest scratch of any metal thus far examined) while the cold rolled steel on which it was deposited, yielded a scratch about 2.2 microns in width. The great hardness of the chromium, and the fact that this as well as its other properties, may be varied by the proper choice of plating conditions, at least justifies its consideration wherever hardness is an essential factor.

Another property of chromium that is distinctive, is its resistance to tarnish or oxidation under many conditions of exposure. Thus it will stay bright for long periods not only in an ordinary atmosphere, but also when exposed to a high humidity, to salt air, to fairly elevated temperatures, to molten tin and zinc, to many laboratory fumes, and to concentrated nitric acid. It is readily attacked and dissolved, however, by hydrochloric acid, and more slowly by sulfuric. This resistance to tarnish therefore justifies its consideration wherever a bright surface is necessary, e.g., on mirrors, even though the reflecting power of chromium is somewhat less than that of silver.

Although chromium itself resists tarnish, it does not necessarily protect an underlying metal such as steel against corrosion, if the steel is anywhere exposed. Thus it may be readily shown that chromium plated steel quickly corrodes at any point where there are pores or pin holes in the deposit. In this respect chromium is similar to nickel and copper, and unlike zinc and cadmium, which latter will protect small areas of exposed iron because the zinc and cadmium dissolve more readily than the iron. Any superior protective action of chromium plating on steel above that of nickel plating must depend upon producing more nearly impervious deposits of chromium than of nickel. From present indications it appears probable that for such uses chromium will generally be applied over nickel plating of good quality, in which case the chromium is chiefly useful for its hardness and tarnish resistance.

With the definite advantages it possesses, it is no doubt surprising to you that chromium plating has been such a recent development. This condition is not the result of any lack of interest in the subject, but from inability until recently, to so define and control conditions that consistent results may be obtained under industrial conditions. Chromium was electrodeposited by Bunsen as early as 1854, and since then numerous papers and patents have been issued on this subject. Of the more recent papers, that published by Sargent[1] in 1920 is probably of greatest interest, as most of the methods proposed since that date represent modifications of Sargent's solution, or of his operating conditions.

Sargent recommended a bath of which the major constituent is chromic acid (CrO_3) in a concentration of about 2.5 M or 250 g/L (33 oz./gal.). To this he added a small amount, e.g. 3 to 5 g/L (0.4 to 0.7 oz./gal.) of chromium sulfate, $Cr_2(SO_4)_3$. From such a bath, Sargent and others have obtained good chromium deposits, but frequently the results have been erratic. H. E. Haring, from a study at the Bureau of Standards (Chem. Met. Eng. 32, 692, 1925) concluded that in such a bath it was necessary to regulate the acidity. This is accomplished practically by having present in the bath a colloidal suspension of chromium chromate, which may form automatically, or may be produced by the addition of any basic or reducing substance.

Even more important than the exact composition of such a bath, is the control of operating conditions, especially the temperature and current density. These have an appreciable effect in all plating operations but in chromium plating relatively small variations in these factors

[1]Trans. Am. Electrochem. Soc., 37, 49, 1920.

may change entirely the character of the deposit, or even prevent deposition entirely. Three principal types of chromium deposit may be produced, though of course these shade gradually into each other. (1) At too low a current density or too high a temperature, a "milky" deposit is produced. This is relatively thin owing to the very low cathode efficiency under such conditions. (2) At the appropriate temperature and current density, e.g. at 45°C (113°F) and 10 to 20 amp./dm² (100 to 200 amp./sq. ft.), a bright deposit is produced. (3) At too high a current density, or too low a temperature, the deposit becomes "frosty," gray and "burnt." Of these deposits, the milky form is the softest, and the bright is the hardest, as measured by the scratch test.

With an appropriate solution, temperature and current density, it is a relatively simple matter to produce bright, hard deposits of chromium upon those articles where a nearly uniform current density may be secured, e.g. upon nearly plane surfaces, cylinders, etc. Upon irregularly shaped articles, and especially those having deep recesses, it is very difficult to get a continuous deposit of chromium of uniform properties. Thus it may then be found that no metal is deposited in the recess, or else the deposit on the projecting parts is gray and spongy. The latter type of coating is hard to buff to a bright surface. This poor throwing power of the chromium solution is due principally to the fact that the current efficiency decreases rapidly as the current density is lowered. Thus at 45°C (113°F), the cathode efficiency at 20 amp./dm² (200 amp./sq. ft.) is about 18 per cent, while at 5 amp./dm² (50 amp./sq. ft.) it is only about 7 per cent, and at slightly lower current densities it is practically zero. This limitation appears to be an inherent defect of baths containing chromic acid, and while minor improvements in the throwing power may be effected, there is little reason to believe that it can ever be made to approach that of a nickel plating bath, much less that of a cyanide copper solution.

Another factor which may affect the introduction of chromium plating on a very large scale, is the relatively large power cost involved. Ordinarily in electroplating the cost of power is negligible, e.g. of the order of one cent or less per square foot. With chromium however the power cost may be from five to ten times as great. This is due to several factors, especially (1) the low electrochemical equivalent of chromium in chromic acid in which it has a valence of six; (2) the low cathode efficiency of chromium deposition, generally about 15 per cent, and (3) the higher voltage, generally 8 to 10 volts, required by the use of insoluble lead anodes and high current densities.

The cost of the chromium itself is not prohibitive, as the metallic chromium in chromic acid at 40 cents per lb. costs about 80 cents per lb. as compared with nickel at 45 cents. A coating as thick as 0.025 mm (0.001″) represents only about three cents worth of chromium per square foot. The total cost of chromium plating is certain to be somewhat greater than that of nickel, as the investment, the power, and the labor cost are all higher in chromium plating. On those products for which the chromium has unique advantages, and especially where the general labor cost represents a large part of the entire expense, the greater cost of the chromium plating may be fully justified.

Among the possible applications of chromium plating, those dependent upon its great hardness are especially promising. One interesting example is its use on plates for printing currency and securities at the U. S. Bureau of Engraving and Printing, where the process and conditions developed by H. E. Haring at the Bureau of Standards are in successful operation. Some years ago the Bureau of Standards cooperated in the design and installation of a plant for reproducing these plates electrolytically. The plates produced by this process have a nickel surface, followed by alternate layers of copper and nickel, finally sweated to a steel plate. These plates are "intaglio," i.e. the designs are below the plane surface, and before each impression the plate is inked and rubbed first with burlap and then with the hand. As all inks contain some abrasive particles, there is considerable wear on the plates. As was expected, the plates with a nickel surface did not last so long as the case-hardened steel plates that were formerly used exclusively.

By the application of about 0.005 mm (0.0002″) of chromium to the electrolytic nickel plates, it was found that their useful life may be increased to about four times that of the nickel or twice that of the hardened steel plates. The impressions are usually sharper, and through the use of smaller number of plates, greater uniformity and security of the product is obtained.

In other branches of the printing industry, it has been found that when very long editions are required, e.g. of labels and soap wrappers, chromium plated electrotypes may be used to produce from 3 to 6 times as many impressions as can be made from the nickel electrotypes.

Of more direct interest to engineers, is the application of chromium to gages. In a recent study at the Bureau of Standards[2] the performance of chromium plated plug gages was compared with that of hardened steel gages. In these comparisons a wear testing machine, devised by the above authors, was employed. By its use, two gages were automatically moved up and down in hardened steel rings, and the wear was measured after a determined number of such gagings. From this study the following tentative conclusions were reached. When exposed to sliding friction, with no abrasive present, the chromium plated gages resisted wear about five times as well as any of the steels tested. When however, abrasive such as fine emery were present the chromium plated surface, while still superior to the steel was only 30 to 50 per cent better. This latter result does not however, mean that the chromium plating is unsuitable for resisting wear by finely divided abrasive such as emery under all conditions. Thus it was found in lapping wear tests that the chromium resists wear from two to four times as well as the customary gage steels. It is at least probable that by depositing the chromium under different conditions, coatings may be produced which are best suited to resist each particular type of wear. For all those conditions of service in which chromium plated gages may be found applicable, they have the advantage that a relatively soft steel may be used as a base and thus dimensional changes with time may be avoided.

In the experiments thus far conducted at the Bureau, a relatively thick chromium deposit (about 0.02 mm or 0.0008″) was applied, after which the surface was ground and lapped to the desired dimensions, leaving a somewhat thinner coating of chromium on the gage when it was tested. A simpler and more economical procedure, would be to apply a relatively thin chromium layer (e.g. 0.005 mm. or 0.0002″) to a finished, accurately under-dimensioned gage. The latter could then be used directly after plating, and, after a predetermined length of service during which about half the chromium would have been removed, the remaining chromium could be readily dissolved off, and a new coating applied. Whether such a procedure will prove practicable remains to be seen. While both laboratory tests and plant practice have indicated that chromium plating may not be universally advantageous on gages, the results are certainly sufficiently promising to warrent further investigation and trial.

The experience with gages at once suggests the appli-

[2] H. J. French and H. K. Herschman. Preprint 18 of the Am. Soc. Steel Treating, September, 1926.

cation of chromium to other steel surfaces exposed to wear, and which now requires special hardening processes. A few observations indicate that chromium plating on certain cams is practical and advantageous. On gears, it may be difficult to produce satisfactory deposits in the depressions, and the wear on the teeth is much more likely to detach the chromium coating. On stamping dies or other surfaces exposed to severe impact, it is at least probable that a light chromium coating would furnish little protection against the deformation of a soft steel base. If, however, chromium can be made to adhere permanently to a case hardened die, it would preserve the details. On dies used in molding plastic materials, the application of chromium will probably be advantageous. More extensive experience than is now available, or at least published, will be required before a final conclusion can be reached regarding these and similar possible applications.

Whenever a bright surface is required, that is not exposed to severe corroding conditions, the application of chromium directly to steel will be advantageous, e.g. on rules and scales for shop use. Where however, steel articles are to be exposed to the weather, it will be found desirable to apply a coating of chromium (e.g. 0.005 mm. or 0.0002″) over a substantial nickel coating (of 0.025 mm. or 0.001″) or still better over a coating composed of a copper and a nickel layer, or a nickel, copper and nickel layer. In the automobile industry great interest is being shown in such applications of chromium plating, and one make of car is now made with chromium plating on the radiator.

On brass articles, such as plumbing fixtures, where there is little tendency for the base metal to corrode, the chromium may be plated either directly on the brass, or on a nickel plated surface. In the latter case however, it is essential that the nickel plating should be very adherent, otherwise it will peel during the chromium plating. The more rapid adoption or at least trial, of chromium plating for such fixtures is undoubtedly hampered by the poor throwing power and the greater personal attention required for consistent production.

With so many research laboratories engaged in the study and development of chromium plating, it seems safe to predict that even though no revolutionary developments appear probable, at least with the present type of bath, a fund of experience will soon be gained, upon which will be based the application of chromium plating to those many purposes for which it is especially suited. Chromium plating is not a panacea, it will not replace all other forms of plating. It will, and indeed has already, served many purposes better than other metals, and some that other metals can not serve.

Note: THE METAL INDUSTRY has published a number of articles during the past two or three years on this subject. The following articles are perhaps the most up-to-date.—ED.

Chromium Plating on Printing Plates. February 1926, page 68–69.

A General Survey of Chromium Plating. March 1926, page 110–111.

A General Survey of Chromium Plating. April 1926, page 151–153.

Chromium Plating Progress. September 1926, page 372–374.

Shall We Have Chromium Plated Gold Jewelry? October 1926, page 419-420.

Extruding Copper Tubes

Written for The Metal Industry by W. J. PETTIS, Rolling Mill Editor

An inquiry appeared in the April issue of THE METAL INDUSTRY, regarding a machine for extruding copper tubes. At that time there was no development in this line that admitted of discussion, but recently, it has been brought to my attention that a German firm has developed a machine which does the work successfully, and it will appear, without doubt, on the market within a reasonable time. The machine consists of two parts, the extruding machine proper and a hydraulic press. The extruding part consists of a chamber "A" where the hot billet to be extruded is placed; a die at one end of the chamber and a mandrel, "M," and a piston "B" at the other end.

The piston "B" and mandrel "M" are operated by the hydraulic press. When the machine is in operation the piston moves in the direction of the arrow, the mandrel "M" pierces the hot billet. The diameter of the hole, pierced in this way, through the center of the billet determines the inside diameter of the tube to be extruded. When the mandrel has cut through the whole length of the billet the piston "B" starts to work against the billet which is compressed, and as there is only one place open, that is the ring between the mandrel, which has reached the die, and the die itself, the metal starts to flow through that ring, forming a tube.

The diameter of the die determines the outside diameter of the tube. The diameter of the mandrel determines the inside diameter of the tube, and the thickness of the extruded tube is equal to the radius of the die minus the radius of the mandrel, allowing, of course, for expansion.

Figure I shows billet "A" set in place and ready to be extruded.

Figure 2 shows the act of extruding. The tube is coming out through the die, "D."

The billet used is cast with a hole through the center, somewhat smaller than the diameter of the mandrel. The casting is large in diameter and short in length, giving the weight desired, and simplifying the core problem, as this is a cylinder and not a billet as we accept the term.

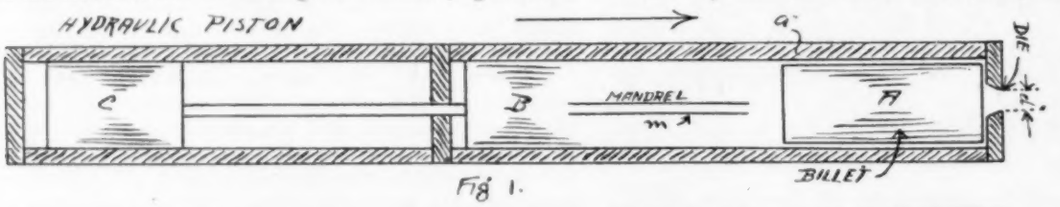


Fig 1.

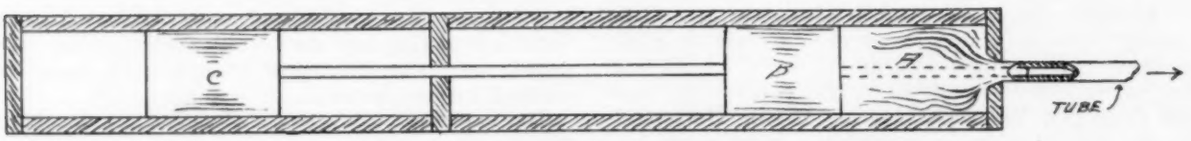


Fig. 2

GERMAN METHOD OF EXTRUDING COPPER TUBES

The Electro-Plating Industry

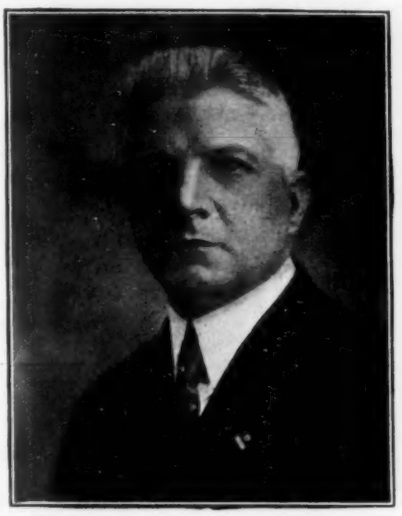
A Review of the Progress in 1926 and Prospects for 1927

Written for The Metal Industry
By CHARLES H. PROCTOR
Plating Chemical Editor

In the closing days of the year 1926, when this review was written, we realize that we have much to be thankful for. We have been blessed with a greater amount of prosperity than any other country in the world.

Industry as a whole did not reach a 100 per cent basis except in special non-competitive lines, but remained quite steady, from a 75 per cent to 85 per cent basis.

The electro-plating industry with its associated lines has shared equally with other lines of business. There is more electro-plating being done in America today than at any time in the past since the industry was first established. The future holds still greater prospects for the industry because another great metal has appeared on the world's stage after lying dormant following a great amount of experiment nearly a quarter of a century ago in America, by Doctor Carveth and his associates, Curry and Sargent. I refer to chromium.



CHARLES H. PROCTOR

CHROMIUM PLATING

The status of chromium in the commercial electro-plating industry is still to be determined, although surrounded by a great deal of mystery and more than a score of patents. In the writer's opinion, prior art, established by Carveth, Curry and notably Sargent, and Le Blanc's addition of boracic acid to Sargent's solution of chromic acid and chromic sulphate, is still the basic solution and no patent can absorb the prior art established by these investigators.

The results of Carveth's and Curry's investigations can be found in the Transactions of the American Electrochemical Society for 1906. Le Blanc's additions of boracic acid to Sargent's solution to produce bright lustrous deposits of chromium is also mentioned in the Transactions for the same year. The resume of Sargent's work may be found in the Transactions of the American Electrochemical Society for the years 1907 to 1920.

Based on Sargent's solution and Le Blanc's addition of boracic acid a commercial working solution can be successfully operated to plate steel or the non-ferrous metals, when the latter metals are previously coated with an adherent film of nickel.

When we consider that chromium is one of the world's hardest metals, we can see that one of its greatest fields of exploitation is in the metal fabricating industry, in the building up of tools and dies that have become worn and undersized, irrespective of their previous hardness, due to friction and wear in mechanical operations. Not only for tools and dies but for coating of molds in all lines of industry where hardness and resistance to oxidation of the mold's surface is desirable will chromium electro-deposits find a great field of exploitation.

There is also probability of further researches in chromium plating operations that will assure a normally conductive solution with throwing power. Unfortunately, chromium **deposits** when applied directly to ferrous metals do not wholly protect the basic metal from atmospheric corrosion which results in rust. For this very reason the automotive industry, except in one or two instances, has not adopted chromium deposits as a standard for outdoor exposed metals.

ZINC AND CADMIUM

Zinc and cadmium are the metals par excellence which give the maximum of protection to ferrous metals as a protective coating against atmospheric corrosion. As metals that are readily electro-deposited, their application is increasing each year and in many instances are replacing sherardizing and hot zincing because of their greater adaptability.

NICKEL

Nickel is still the greatest commercial electro-deposited metal. Its beauty of lustre so far has not been surpassed by any other metal. When correctly applied, the increased rate of deposition by hot solutions with higher metal concentrations enables the manufacturer to deposit nickel in one tenth the time formerly taken for what might be considered a normal deposit. Nickel is still the metal pre-eminent in the automobile industry for internal hardware and outside exposure and its continuation is assured.

HARDWARE

The builders' and plumbers' hardware industries are still in a busy state. Building programs are still above normal so the demands for these products still continue unabated.

Finishes on builders' hardware have not changed to any extent. Brush and antique brass finishes still predominate. Antique copper in several novel finishes are still in great demand. Silver and gold finishes are used to a great extent. All these finishes lend themselves to internal home decoration.

In the finished plumbers' hardware industry where bright nickel finishes prevail, chromium should prove a splendidly resistant metal. Deposited upon a nickel plated base, it would assure resistance to wear, due to its extreme hardness, and a bright enduring lustre, due to its resistance to atmospheric oxidation and moisture. There is a great field for chromium in the plumbers' hardware industry.

LIGHTING FIXTURES

The electric lighting fixture industry is still enjoying splendid business due to the continuous building program and constant replacement of old style fixtures with those of modern types.

The designs and finishes are of endless variety. Finishes are in all commercial metals with gold and silver predominating when cost is not a factor.

Antique finishes in endless variety are still standard with applied enamels and pigment lacquers predominating in polychrome effects which enable the manufacturer to produce rare combinations in color tints.

LACQUERS

The lacquer industry is sharing the prosperity of other industries, due to the continued use of colored lacquers and enamels in the automobile and furniture industries as well as the novelty lines.

Cellulose lacquers and enamels have largely replaced the older types of colors and varnishes.

SILVER

The Sterling silver and silver plate industries are in a fairly good condition and their production is on a par with other lines. The demand of the American public for something new or the reproduction of past art in silverware keeps the silverware industry constantly producing something new and attractive.

Semi-lustre finishes still prevail that closely follow the old Sheffield silver finishes. For lustre burnished silver and gold finishes remain standard.

Antique silver finishes are still very attractive and their continuation is assured. No finish can exceed the quiet beauty of antique silver finishes when artistically applied.

JEWELRY

The jewelry industry in all lines of production is in fair condition but has not reached above the 75 per cent stage.

If you look into the shops where jewelry is displayed in any part of the country, especially in the large cities, and are interested in commercial production, you wonder where all the jewelry and watches go, year after year, to say nothing of the millions of clocks made each year. Then think of the people who are the consumers and the answer is clear. Woman is the greatest consumer. The jewelry that adorns the average man is long lived and is not replaced very often.

Green gold, white gold, antique green, antique red and yellow are a few of endless variety of combinations to satisfy the tastes and pocketbooks of all.

Platinum is still the rich man's gold. Due to the intrinsic value of the metal, it is used in endless variety, either as solid metal, and in combination with white and green gold to lower the cost. Its use will continue and in the writer's opinion will still be in greater demand as the years go by.

The white gold fabricating industry became alarmed recently, due to the introduction of a finish entitled "Nu White" which is essentially a chromium deposit. The writer commented upon this innovation in THE METAL INDUSTRY for October, 1926, under the title "Shall We Have Chromium Plated Gold Jewelry?"

PLATERS' RESEARCH FUND

To close this review without mentioning the work of the Bureau of Standards in collaboration with the American Electro-Platers' Society, to raise the standard of the electro-plating industry, would be a neglect of duty.

I wish again to urge the manufacturer of metal goods, as I did a year ago, to support the splendid work carried on by the Bureau of Standards and the American Electro-Platers' in research work for all manufacturers irrespective of their lines.

It will require $10,000 a year to carry on this work and it is up to the manufacturers of the United States and Canada to contribute; the minimum amount is $50 per year. Every manufactuer who believes in American progress can certainly contribute this amount. About $5,000 has so far been raised through the untiring efforts of the members of the American Electro-Platers' Society, an educational society with no outside affiliations.

For years it has been intimately associated with the Bureau of Standards, ably assisted by Dr. William Blum and his associates, and the American Electrochemical Society. These associations demand the representation of all manufacturers who do plating or finishing, in the American Electro-Platers' Society through their foremen platers. Every foreman plater should become one of its members.

To the manufacturer: **please send in your subscription to this splendid cause.** The elimination of spotting out of plated products in your plant would be worth many hundreds of dollars to you each year. This is one of the great big costly troubles that must eventually be eliminated. The Bureau of Standards and the American Electro Platers' Society will do the work for you.

Depositing Solder

Q—I would like to know if there is any system known, whereby a proper electrolyte and other conditions, might be combined to make it possible to plate a surface of brass with a solder plating, the solder being composed of equal parts of tin and lead.

While I realize that in the usual form of work, the tin will be conveyed to cathode without difficulty, and the lead probably drop off to the bottom, nevertheless would appreciate your views on the subject, as it would be very valuable to us, if such a proposition might be handled.

A—Lead and tin or solder metal have been successfully deposited by the U. S. Navy Department in recent years.

The electrolyte suggested by Blum and Haring, Transactions of American Electrochemical Society, volume 40, page 147 (1921) is a lead-fluoborate solution. The tin is drawn into the solution by electrolysis until the required amount has been reduced by weight calculation.

This is accomplished by the porous cell method. It might be worth your while to read Electro-Plating and Electroforming by Blum and Hogaboom. Lead tin alloys are elaborated on, on page 318-320; lead solution advocated for the purpose on page 283.—C. H. PROCTOR.

Electro Plating Tin

The Process described in my article on page 502-3, December, 1926, which includes the use of Sodium Stannate and Hydrated Tin Oxide, is covered by U. S. Patent 1,598,295 dated August 31st, 1926; Inventor Horace Russell McIlhenney, and assigned to the Vulcan Detinning Company. The latter are the producers of the only pure and concentrated grade of Sodium Stannate in the Market.

The Hydrated Tin Oxide mentioned is referred to in the Patent as 'Soluble Tin Salts' and is actually marketed under that designation. The fact that it has only been comparatively recently that solutions for electro tinning including the use of Sodium Stannate have been developed, is due without question to the poor quality of Sodium Stannate which alone was procurable up to a short time ago when the Vulcan Detinning Company, first started producing this material. They use a decidedly more effective method than had been employed heretofore and for which they have Patent protection. The goods formerly produced contained about 17 per cent tin while Vulcan's goods are said to test about 40 per cent.—C. H. PROCTOR.

Progress of Metals in 1926—Outlook for 1927

Various Metals Discussed for The Metal Industry by Leading Authorities

Copper

By WILLIAM A. WILLIS

Manager Copper & Brass Research Association

WILLIAM A. WILLIS

The American copper industry, like other industries whose products demand a world market, has been built to its present proportions on the basis of a fixed foreign demand. With about 60 per cent of the world's copper being produced from American mines and more than 80 per cent being refined here and shipped to ultimate consumers in and out of America, it will be seen that the United States handles more copper than it could possibly consume by itself at this time, despite the enormous increase in consumption on this continent in the last few years. If our great copper producing and refining facilities are to be kept to the limit of their activities, our exports of the metal must be maintained at a point where they balance the vast American consumption. It will, therefore, be seen that any forecast of copper prospects during 1927 must be predicated on Europe's buying power during the year, because there are no signs of any abatement of domestic consumption.

Europe is extremely sensitive to certain internal conditions, which before the war would not have so seriously affected her economic structure. The British coal strike was deadly in its effect; the depreciation of the franc paralyzed French business and now the rapid rise of the franc is having almost equally embarrassing effect. The situation generally, however, seems somewhat improved, and this appears especially true of Germany, according to the latest report of Mr. Parker, the Agent General for Reparations. So if no untoward circumstances arise, Europe's purchasing power may be much improved during 1927, and nothing could mean more for the copper industry than that, because Europe is far behind her requirements for copper and will almost surely buy in large quantities when she is able to. The operation of Copper Exporters, Inc., is expected to have a stabilizing effect on European prices for copper and to remove the speculative element abroad which has been most harmful.

Domestic shipments of copper during 1925 reached a new high level for peace times, yet during the first eleven months of 1926 domestic consumption was greater by approximately 18,000,000 pounds than for the entire previous year. December figures will not be available until well into January, but it is already clear that a new high level is to be established.

There is no doubt but that the American people have come to a better appreciation of the ultimate economy in the use of quality materials, not only in building construction but in articles of manufacture. There are no signs of any recession from this viewpoint and this augurs well for all industries whose products come under the head of "quality." By this is meant commodities which, although representing a slightly higher initial cost, make up for this and become cheaper in the end through their practically everlasting service. The American repair bill, in building, in which rust is a very decided factor, has been estimated as high as two billion dollars annually. The new trend toward quality materials is steadily bringing down this huge total and copper and its principal alloys, brass and bronze, are playing no small part in this constructive work.

The year 1927 should be another peak year in domestic copper consumption. Building is continuing at record pace and the best authorities agree that the coming year will see at least another five billion dollars spent in construction.

Tremendous electrical expansions are either under way or being planned for consummation in the next twelve months. The automobile industry, although undergoing a seasonal slackening recently, is expected to have a record output, and in all of the fields of smaller consumption the outlook is excellent.

In the circumstances one cannot help but look to 1927 as a splendid year for domestic copper consumption. As already stated, however, we must take Europe into consideration, for the copper market is a world market after all.

Tin and Lead

By O. C. HARN

National Lead Company

No new developments of moment have been observed during the year 1926 in the use of lead and tin. The most important progress noted is in the large use of lead in the various phases of the electrical industries. In these fields there seems to be no let-up in development and expansion.

Progress in both lead and tin has otherwise been along well established lines, such as for paints, type metals, solders, babbitts, roofing, pipe, traps, and bends, etc.

Statistics of production and consumption for 1926 have not yet been compiled, but the year as a whole has been fairly satisfactory.

Zinc

By STEPHEN S. TUTHILL

Secretary of the American Zinc Institute, Incorporated

My comments on the nick-naming of zinc and the products in which zinc plays an important part, inspired by an editorial in the December number of THE METAL INDUSTRY, appear in the form of a letter in another part of this issue.

I must confess, however, that it is far better to be given a nick-name than to be denied any name.

This observation is prompted by the recent tendency on the part of some iron and steel men to advertise sheet steel protected by zinc under the name of "Sheet Steel."

This practice has led to considerable complaint from the members of the American Zinc Industry.

STEPHEN S. TUTHILL

There are sheet metal workers, too, who complain of this innovation (?). These consumers have been in the habit of ordering sheet steel when they wanted sheet steel and "galvanized," or hot zinc coated iron or steel, when they wanted iron or steel protected by the best of all protective coatings, namely, zinc.

Why persist in this illusion that sheet steel itself has all of the merits of sheet steel plus zinc?

Sheet steel, when exposed, soon resolves itself into its elements, while sheet steel protected by zinc has a durability that sheet steel, in an unprotected state, does not have.

There is as much logic in calling brass "copper" as there is in applying the name "sheet steel" to iron or steel, hot zinced, or "galvanized."

Furthermore, the Standard Dictionary says that sheet metal is metal made into sheets, usually by rolling, like sheet iron, sheet brass, sheet steel, etc., not over ¼" in thickness. Truly, "sheet steel" used in this way is a misnomer, and a misnomer, according to the same dictionary, is "a name wrongly or mistakenly applied; an incorrect or inapplicable designation."

A pending question in relation to hot zinced iron or steel is the proper weight of coating for various uses, the percentages of which shall be known to the consumers.

The problem of National Standard Specifications for all zinc coated material is now being solved by the Sectional Committee on Specifications for Zinc Coating of Iron and Steel under the rules of procedure of the American Engineering Standards Committee and the sponsorship of the American Society for Testing Materials. As Secretary of this Committee, the writer is in a position to say that the several sub-committees are making unusual headway in arriving at National Specifications for all zinc coated material.

The National Committee on Metals Utilization, created by Secretary Hoover during the past year, will be of great service to industries in this regard. A preliminary investigation disclosed that in the case of specifications which have been promulgated by some standard-making body, and which are intended to cover all of the normal needs of industry are being used by only a few individual concerns. The result is that there are numerous specifications, differing only slightly from each other, but other concerns are making their own article a "special" and adding their weight to the general increased cost of production. In this respect the work of the National Committee will be to unify and standardize specifications, already decided upon and to be decided upon, and to bring about their general use in industry; a consummation devoutly to be wished.

Referring to the zinc industry as a whole, the United States continues to produce and consume more Zinc than any other country in the world.

The domestic slab zinc production will probably exceed 630,000 tons in 1926. This is the greatest peace-time production in the industry, and between 7% and 8% greater than in 1925. As in later years, two-thirds of the concentrates from which this zinc is produced come from the Joplin-Miami field, the greatest zinc field in the world.

The rolled zinc production in 1926, for which there are as yet no available statistics, will probably show a gratifying increase over 1925. This, however, will depend very largely upon the reaction of the rolled zinc industry to the curtailment of demand from several sources in the latter part of the year.

In 1925, approximately 50% of the zinc produced was used in zinc coatings. Information so far available indicates that there will be an increase in the use of zinc for sheets and plates, but that the showing will probably be not so favorable in respect to other zinc coated products.

Indications also are that the use of brass and other alloys will show a marked increase in 1926. Thirty per cent of the zinc in 1925 was used for these purposes.

The industry goes into 1927 with a small surplus of zinc concentrates in the Joplin-Miami district and about one week's supply of slab zinc in the hands of the producers. This keeping of production in line with consumption is largely due to the statistical services furnished to the industry.

So the American zinc industry, guided by its statistical services, crosses the threshold into 1927 with confidence that its production equilibrium will be maintained.

Aluminum

By Aluminum Man

The prediction of increasing stability for the aluminum industry which we made in our review last year has been justified. Normal increases in the uses of aluminum have been made in virtually all aluminum products. In some instances extraordinary increases have occurred. A number of new uses have been developed or suggested, with important promise for the future.

One of the largest increases during 1926 has been in the use of aluminum bronze powder for paint. Although this paint originally came into favor largely because of its heat-reflecting power, which makes it exceptionally suitable for such objects as storage tanks for oil, it has been found that aluminum paint is highly advantageous for painting interiors to conserve daylight and increase illumi-

nation. The high reflecting power makes it the best material known for this purpose.

Another field in which the interest in aluminum has increased remarkably during 1926 is in radio. The trend of the radio industry is unmistakably in the direction of what is called "shielding"; which means that coils, condensers, tubes, etc., are surrounded, more or less completely, by plates or boxes of metal. Relatively thick metal is necessary because the shielding efficiency is due to the high electrical conductivity of the shields. A large percentage of commercial radio receivers are now constructed with such shields and it is certain that this use will increase during 1927. Aluminum has proved to be the best material for such radio shielding, having the advantages of light weight and relative cheapness, in addition to its high electrical conductivity.

In the manufacture of variable condensers for radio use experience has shown that aluminum is superior. Difficulties due to warping of the metal have been overcome. Die-castings of aluminum are also entering this field, especially for the construction of the precision variable condensers now increasingly in demand. Aluminum foil is finding large application in the construction of fixed condensers for radio. It is certain that the consumption of aluminum by the radio industry will increase rapidly during 1927.

In the field of strong aluminum alloys, the outstanding illustrations of the year's developments are automobile bus bodies and the construction of a street-railway car. A railway car, built for the Cleveland Railway Company, was shown at the annual meeting of the American Electric Railway Association at Cleveland, in October, and attracted much favorable attention. Several all-aluminum automobile bus bodies have been constructed during the year, notably the body for the Versare Bus, built at Albany, New York, which is virtually an automobile Pullman car for use on highways. Legal limitations of weight for buses are placing a great premium on the use of aluminum alloys as substitutes for other metals. Another important field of lightweight construction was shown during the year by the speedboat, Cigarette IV, constructed of aluminum alloys, which won the President's Cup.

Aluminum shingles are growing in favor, being both light-weight and fireproof. The steeple of the German Evangelical Protestant Church in Pittsburgh, constructed this year, is surfaced with ornamental plates of cast aluminum alloy and presents a beautiful and dignified appearance.

Among smaller aluminum structures, increases of consumption have been marked in such items as washing machines and mechanical household refrigerators. Strong aluminum alloys have been suggested for the construction of high speed elevator cages, their use permitting reduction in the weights of counterpoises and hence in the consumption of energy in starting.

In the fields of aircraft, electrical conductors, cooking utensils, screw machine parts and so on, business developments have been satisfactory.

Aluminum foil is finding increased use in the wrapping of food products, as it avoids any possible danger of poisoning. Collapsible tubes made of aluminum are also growing in use, the relative stiffness of the material having proved to be an advantage appreciated by the ultimate consumer.

The cooking utensil market has been marked by increases in the use of the thick utensils, now increasingly popular for cooking vegetables in their own juices, a procedure highly recommended by hygienic authorities.

Aluminum chairs, mentioned in last year's review, have proved successful on railway dining-cars, libraries, and in similar service. Aluminum furniture for office use is now in preparation, with excellent commercial prospects. Another use of aluminum in radio is for radio cabinets, the development of aluminum furniture having made possible the production of cabinets decorated to resemble wood. Radio panels similarly decorated are now on the market.

A new market for aluminum which shows promise is in bells. Aluminum bells possess excellent tone and are much lighter in weight than bells made of the more conventional metals.

In the manufacture of aluminum the chief development of 1926 was the commencement of operations at the aluminum reduction plant constructed by the Aluminum Company of Canada at the new aluminum city of Arvida, named for Mr. Arthur Vining Davis, President of the Aluminum Company of America, and located on the Saguenay River in the Province of Quebec. This plant draws electric power from the Isle Maligne power plant at the head of the Saguenay River.

Nickel

By WILLIAM B. LAWSON

General Manager of Sales, International Nickel Company

With the extension of the knowledge of the improved properties secured by the addition of Nickel as an alloying element to both ferrous and non-ferrous metals, its use has increased and its field of application has steadily widened. That this extension of the use of Nickel has been based, primarily, on improved performance secured or economies effected, is most encouraging and indicates that a healthful rate of expansion should be maintained for some time to come.

Nor has the producer failed to keep pace with the progress of industry. As a result of improved practice, refined Nickel having a purity of 99.90% is now commercially available. This product, which is produced in a new electrolytic plant recently completed by The International Nickel Company of Canada, Ltd., is free from carbon and sulphur and is the purest form produced commercially.

For years the automotive industry has pioneered in the use of alloy Steels. In their efforts to secure better operating efficiencies automotive engineers have leaned more and more towards the small bore, long stroke, high pressure, high speed type of motor. The adoption of this type of motor precipitated numerous intricate problems of design, not the least of which was the development of a suitable piston to meet the new conditions of high temperature and speed. Aluminum alloys, due to their high thermal conductivity and light weight, offer many advantages for this application but the high co-efficient of thermal expansion of Aluminum, as compared to that of cast iron, made it necessary to use large clearances that resulted in piston slap and scoring.

By the use of struts made of 34–36% Ferro-Nickel alloy, which has a negligible co-efficient of expansion, it was possible to produce a compensated Aluminum alloy piston with an over-all co-efficient of thermal expansion equivalent to that of cast iron. This type of piston has now been adopted by Chrysler, Packard, Paige, Marmon and numerous other manufacturers of high grade motor cars.

Two other interesting alloys of Nickel and Iron recently developed are "Permalloy" and "Nickeloy." The former

is composed of about 80 per cent Nickel, balance Iron, and the latter of about equal parts of Nickel and Iron. When properly heat treated, both have extraordinarily high magnetic permeability at low magnetizing forces. At the present time "Permalloy" is used principally in submarine cable applications and "Nickeloy" for cores for radio transformers.

The growing popularity of the practice of heat treating metals has stimulated the demand for materials that would retain their strength and resist oxidation at elevated temperatures. Combinations of Nickel and Chromium, or of Nickel, Chromium and Iron, have been found very suitable for service of this kind and in cast form are used almost exclusively for such applications as annealing boxes, carbonizing boxes, combustion chambers, cyanide pots, oil burners, pyrometer tubes, glass rolls, recuperators, furnace parts, enameling racks, etc.

The many functions of Nickel as an alloying element in brass and bronze are becoming better known and more appreciated. It has been demonstrated that when used in small quantities to "densify" brass or bronze pressure castings it results in sounder castings, reduced loss and consequently increased production and lower costs. Much progress has already been made on this development and, as Nickel is today selling for much less than tin, it appears inevitable that, its beneficial effects having been established, foundrymen will give more and more consideration to the use of Nickel in the brass foundry.

A demand has existed for some time for pressure tight white metal castings for plumbing fixtures and similar applications. Considerable study has been given to the production of suitable castings for such purposes and a midwestern manufacturer is now producing satisfactory Nickel alloy white metal castings which are pressure tight and will take and retain a high polish.

The past year has seen a revival of interest in the use of Nickel in light aluminum castings. This interest is increasing steadily and should result in an appreciable consumption of Nickel for applications of this kind.

Even in the arts Nickel is finding a definite place. Incorporated with zinc in gold it forms the now popular and handsome white gold. Some idea of the amount of white gold produced may be gained from the fact that several tons of Nickel are consumed annually for this application.

Among the strictly chemical applications, the use of Nickel as a catalyst in the hydrogenation of oils is growing steadily. The possibilities for certain Nickel compounds, as demonstrated by the classic Edison storage battery, are daily being more appreciated.

The availability of high purity Nickel anodes in suitable rolled, electrolytic and cast forms, and the growing use of automatic conveying and plating equipment has lead to the adoption of more suitable standards for Nickel coatings. The remarkably increased resistance to rust of heavy Nickel plates is now widely recognized and progressive manufacturers, particularly in the automotive industry, are including, in their specifications for Nickel plated articles, a salt spray test.

The producers of rolled forms of pure Nickel and copper-nickel alloys, principal of which is Monel metal, have increased their mill facilities during the past year. By the installation of the most modern types of melting, heating and rolling equipment, standard products such as sheets and bars have been improved in mechanical properties and finish and new products such as tubing, both welded and seamless, and full cold rolled sheet and strip made available to the trade at reasonable prices. This has, particularly in the case of Monel metal and rolled Nickel, made possible the extension of existing markets and opened up attractive new markets.

The more promising developments in rolled Nickel and Monel metal include their use for utensils for hotels, restaurants, cafeterias and hospitals, the use of polished sheet for trim on mechanically refrigerated ice cream cabinets, soda fountains and food handling and serving equipment, and the use of tubing, rod and sheet in the dairy and chemical industry.

In view of these encouraging signs it appears reasonable to expect that the ensuing year will be a satisfactory one for the Nickel industry, and that the consumption of Nickel and its alloys will increase.

Precious Metals

By C. M. HOKE

Consulting Chemist, Jewelers Technical Advice Company

Gold. The price of gold is fixed by statute at $20.67+ per oz., and though the purchasing power of that sum may fluctuate widely, the price of the metal is standard. The metal can always be sold to and bought from the U. S. Government.

There have been no outstanding events in the metallurgical aspects of the metal, and its place in finance need not be discussed here. In the arts, it is noted that white gold jewelry is tending to displace yellow and green gold, though not platinum.

Silver. The silver market is expected to slump still lower. The international markets are unsettled for several reasons, among which should be mentioned the instability of China and the situation in India. India, after long adherence to the silver standard, is expected to change soon to the gold standard and this will have far-reaching effects. The Indian government may release twenty to twenty-five million oz. silver every year for ten years, and in spite of that country's large consumption of the metal, this also should have an effect upon the market.

Platinum. A good world supply of platinum and sluggish demand, have resulted in a quiet market. The new South African fields are producing very well, the proportion of iridium, however, being lower than it was at first. Colombian fields are also doing well. The Russian situation remains unchanged; that is, while it is believed that Russia contains much metal, both in and out of the ground, it is not forthcoming.

Owing to a depression in the whole jewelry industry, the demand for platinum is at present poor. Refiners also report a lessened demand for palladium as an alloying metal in jewelry, though its use in dentistry is growing.

The need for stamping or hall-marking platinum has resulted in the formulation of bills, which will soon be acted upon both here and in England. The bill proposed in this country, after several years of debate among platinum users, is extremely complicated, and the outlook for its adoption is gloomy.

Old Metals. Old gold and silver should be sold to the Government; for details inquire of the U. S. Assay Office, Wall Street, New York, or any of the other government assay offices. The requirements are simple and reasonable. Also any reputable dealer will give a fair price. However, since the government does not pay for platinum, persons wishing to dispose of it must go to the refiners or dealers.

Charles Frederick Brooker

Chairman of the American Brass Company Passes Away

Charles Frederick Brooker, chairman of the board of directors of the American Brass Company, died at Daytona Beach, Fla., December 20, 1926 from arteriosclerosis. He had been ill about a week following poor health since last spring when he suffered a stroke of paralysis after a trip to the West Indies. If he had lived until March 4, he would have been 80 years of age and would have been with the American Brass Company or one of its predecessors, 63 years.

CHARLES FREDERICK BROOKER

Mr. Brooker was born in Litchfield, March 4, 1847, and entered the employ of the Coe Brass Company of Torrington at the age of 17 as a bookkeeper, becoming its secretary in 1870. On the death of Lyman W. Coe, his uncle in 1893, Mr. Brooker became president. He played an important part in combining the Coe Brass Company of Torrington, Waterbury Brass Company, Holmes, Booth & Hayden, Benedict & Burnham, the Ansonia Brass & Copper Company and the Coe Brass Company into the American Brass Company in 1900 and afterwards acquiring the Chicago Brass Company of Kenosha, Ill. He was president of the American Brass Company from its organization until 1920 when he became chairman of the board.

He was a director of the Anaconda Copper Mining Company, which owns the stock of the American Brass Company and also of the U. S. Smelting & Refining Company, the Chile Copper Company, Chile Exploration Company and the New Haven Railroad. For many years he was a member of the Republican State and National Committees and was one of the five members of the executive committee of the latter. He was a member of the Union League Club, the New England Society, the Engineers' Club, the Lawyers' Club, the Transportation Club all of New York and the New York Chamber of Commerce and the New York Yacht Club. Although the general offices of the American Brass Company are in Waterbury he had made his home for many years in Ansonia with the exception of intervals spent in New York and Florida. In former years he was a director in many manufacturing companies, banks and water companies throughout the Naugatuck valley.

Mr. Brooker married, in 1894, Mrs. Julia Clarke Farrel, widow of Alton Farrel of the Farrel Foundry & Machine Company, Ansonia, Conn. He had no children. Mrs. Brooker died in 1917. Mr. Brooker's step-son, Col. Alton Farrel, Jr., is now head of the Farrel Company.

The funeral was held from Christ Church, Ansonia, December 23, 1926 and burial was in Torrington. Among the honorary pall bearers were: Chairman of the board of directors John D. Ryan and President Cornelius F. Kelly of the Anaconda Company; President John A. Coe, Treasurer C. F. Hollister, Vice President E. L. Frisbie, Secretary E. H. Yates of the American Brass Company; President E. O. Goss of the Scovill Manufacturing Company; President I. H. Chase of the Waterbury Clock Company; John P. Elton, former Vice President of the American Brass Company; Harris Whittemore of Naugatuck, Charles F. Bliss, Charles E. Steel, and W. A. Cowles of Ansonia; Benjamin B. Thayer, H. B. Thayer, A. H. Melin, Albert L. Salt, and William N. Cromwell of New York; Thomas W. Bryant and Robert C. Swayze of Torrington, Conn., and Edward P. Brown of Boston.

Mr. Brooker's charities were numerous. Yale University, Dartmouth College and Leland Stanford Junior University each are to receive $50,000 from the estate. Mr. Brooker left upward of $3,000,000 in specific bequests to relatives and charitable and educational institutions. The Maria Seymour Brooker Memorial, Inc., of Torrington receives $200,000, the New Haven County Anti-Tuberculosis Association $100,000, and the Kenosha, Wis., Hospital $20,000. Other charitable institutions benefit by bequests of from $10,000 to $50,000.

In the issue for May, 1914 THE METAL INDUSTRY published a report of a celebration in honor of Mr. Brooker's fiftieth year of activity in the brass industry and also an extended account of his industrial career. In May, 1924, a celebration was held to commemorate his sixtieth year and recorded in THE METAL INDUSTRY.

Mr. Brooker was the last of the three contemporary Generals of the Brass Industry in Connecticut. The others were Chauncey P. Goss of the Scovill Manufacturing Company who died July 19, 1918 and Henry S. Chase of the Chase Company, who died March 4, 1918.

Tributes from Mr. Brooker's Friends and Associates

"I feel deep personal loss in the death of my old friend and associate, Charles F. Brooker and that feeling is shared, I am sure, by every one identified with the copper and brass industry," said John D. Ryan, chairman of the board of directors of the Anaconda Copper Mining Company. "Mr. Brooker was in every sense the dean of the industry. He was engaged in it for more than 60 years and for the greater part of that time in positions of influence and prominence. He built a great organization and worked unceasingly for the good of the industry, not only on his own particular side but for the welfare of the whole. He built a wonderful organization and conducted

it admirably. He dealt fairly and justly and leaves to us a memory that we will all honor."

John A. Coe, president of the American Brass Company for himself and on behalf of his and Mr. Brooker's associates in the company, said:

"His friends were legion and he numbered among them many of the nation's most distinguished citizens. Thrown on his resources at an early age, he developed a strong reliance and he had the greatest faith in mankind. He was charitable and contributed substantial amounts to charity. While he was laden with cares of the greatest responsibility he always had time to see any one. He always used to say the busiest men in the world are never busy. He delighted in the company of friends and had a remarkable memory and faculty of remembering persons' full names over a span of years. He was one of the few factors in the growth of Connecticut."

"Mr. Brooker was so close a friend of mine that it is hard for me to make a statement," said John P. Elton, President of the Blake & Johnson Company and President of the Dime Savings Bank. Prior to the purchase of the American Brass Company by the Anaconda Company, Mr. Elton was Vice President and Treasurer of the former company. His father, James S. Elton, was President of the Waterbury Brass Company and both father and son were for many years, business associates of Mr. Brooker.

"I knew him when I was a child," he said. "He was a close friend of my father and I always looked up to him in childhood and have since with the greatest of respect. Since childhood I feel he has been my friend and throughout the time I was associated with him in the American Brass Company our relations were much more than those of usual business associates. The Naugatuck valley, the State and the Nation will miss him greatly."

"Mr. Brooker's life was almost a romance," said Frederick S. Chase, President of the Chase Companies, Inc. "It is true today as it was when he started that there is room for ability, integrity, and loyalty in industry. His rise from a position of unimportance in the Coe Brass Company to the chairmanship of the American Brass Company has been one of steady progress and well merited at every step. He must have felt a very genuine satisfaction that under his leadership those interests entrusted to him had been protected and his judgment vindicated.

"Not only was he easily at the head of this industry, which is of the greatest importance to the state, but in addition to that, he illustrated all through his life what a good citizen should be. In politics he occupied an important position; had high ideals, was practical and constructive and won the confidence of everyone with whom he came in close contact. His interest in his employees was most intimate, personal and cordial and he was not so engrossed in his business affairs but that he took plenty of time to attend to matters of public interest and public charity."

"The country has lost the dean of its brass industry, Connecticut one of its most loyal citizens, the Naugatuck valley, one who always exerted the most powerful influence for its development and prosperity, and a great many of us, a good friend," said John H. Goss, Vice President and General Superintendent of the Scovill Manufacturing Company, speaking for himself and E. O. Goss, President of the company.

Bronze Peace Memorial

In commemoration of the last address of President Harding, delivered at Vancouver, B. C., on the enduring friendly relations between Canada and the United States

Photo Ewing Gallery, N. Y.

VANCOUVER PEACE MEMORIAL

this splendid memorial has been erected there. Everlasting Bronze, here, is symbolizing permanent friendship.—Bulletin of the Copper & Brass Research Association.

Decorated Metal Work

This large brass plate is of medieval manufacture with the Annunciation shown in the center.

GERMAN METAL WORK, 15TH CENTURY

The Bronze Age

An interesting picture published in a recent issue of the Scientific American, reprinted from The Illustrated London News, shows a Bronze Age farming village in England about 3000 years ago. The dwellings consisted of conical huts resembling in structure the American Indians' tepees, except that the English huts were of woven twigs and branches, plastered with mortar, while the Indians' tepees consisted of skins covering a few tent poles.

Although the picture represents a village in the Bronze Age, little or no bronze is shown. The only evidence we have is the existence of "household" utensils of the Rustless, Everlasting Metals and implements of warfare headed or tipped with the same material.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

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EDITORIAL

Review of the Metal Industries for 1926—Outlook for 1927

In beginning our review of the past year we must open with the same words that we used in these columns a year ago. The year 1926 was a good year. In the United States as a whole we reached a peak of prosperity never before equalled. Production, consumption, the physical quantity of exports and imports and the rate of wages have, according to the Department of Commerce, all been at the highest levels.

Contrary to most of the forecasts, the automobile and building industries went higher than ever before. The electrical field ran true to form as expected with a 10% rise. The railroads bought conservatively, but still they bought in fair volume, spending almost $900,000,000.

In the methods of doing business, the same principles were observed which have kept business on such an even keel since the recovery from the crash of 1921. Orders were placed conservatively, in small volume and only as needed. The margin of profit was small but in most cases it was not unreasonably so. There resulted a large turnover at minimum prices, reaching down to the ultimate consumer who consequently bought freely.

It is hard to pick out any one factor as of primary importance in the general prosperity, for so many have their bearing on the general situation and are contributing causes. It is probable, however, that the combination of such widespread employment, together with the most reasonable possible prices under circumstances, has done more than anything else to make for prosperity.

A few weak spots still appear. The textile industries have suffered badly in most of their branches. Agriculture has not been very prosperous. Those major industries upon which the consumption of metal depends, however, have, by and large, been in excellent condition. It is not only that the volume of business has been satisfactory, but that it has been a sound uninflated volume, turned out to satisfy close, careful buyers who have placed orders for their actual needs and not to cover themselves in a speculative market.

METAL PRICES IN 1926

With few exceptions, the course of metals in 1926 was steady and in the lower ranges. Copper has remained throughout the whole year around 14c per pound, moving from very little above to a little below that point. Zinc, beginning the year about 8c, slid to about 7c and has remained there. Tin has been one of the exceptions, averaging about 62c or 63c for the first six months and then rising to about 70c. Lead has averaged about 8c, moving between 9c and 7½c. Aluminum, of course, has been fixed, first at 28c, dropping to 27c shortly after the middle of the year. Electrolytic nickel has been fixed at 39c. Antimony slumped sharply from 23c to 12c in the first five months, going back to 16c and then gradually dropping to about 13c. Silver has been hard hit, showing an almost uninterrupted decline from 67c per oz. at the beginning of the year to about 54c per oz. at the present time. Platinum started at $115 per oz., went down to $106, back to $114, and is now at about $107.

Viewed as a whole, metal prices were not attractive from the speculative standpoint, except for tin. The rest were static at a comparatively low point or else declined.

TECHNICAL PROGRESS

Among the outstanding events in the technical progress of metals during the past year was the publication of the methods of hardening lead alloys, particularly the lead-antimony system, by R. S. Dean and his associates. A new method of arc welding, developed by the General Electric Company, which uses a flame of atomic hydrogen, also bids fair to make a great impression.

Undoubtedly the greatest strides in the electro-plating field have been made in the deposition of chromium. This metal which, a short time ago, was only a laboratory curiosity and, more recently, was restricted to steel alloys, is now of the utmost interest as a protector against corrosion. Great things are expected of chromium plating and we are confident that its early difficulties and struggles will soon be passed. The patent situation in this field is still indefinite.

As regards melting and foundry practice, no new equipment of revolutionary character has appeared. The electric furnace for metals is now to a great extent standardized. The preference of the industry seems to be for two types, namely the induction and indirect arc, depending upon the circumstances under which they are expected to operate.

No review of technical progress is complete without mention of the work of the Bureau of Standards. In co-operation with the Research Committee of the American Electro-Platers' Society, the Bureau is carrying on investigations into chromium deposition, zinc plating and nickel plating. In addition, projects have been laid out for broadly extending the work of the Bureau. This work is to be supported by a fund of $10,000 per year to be contributed by manufacturers and those interested in electroplating. Among the problems to be investigated are:

1. Spotting out.
2. Copper cyanide solutions.
3. Brass plating.
4. Silver plating.

We have no hesitation in interrupting this record of progress with an appeal to our readers to join us in contributing to this fund.

The various technical committees of the American Foundrymen's Association have been too recently organized to report anything definite as yet, but some of the work under way deserves mention even at this early date. The Joint Committee on Foundry Refractories has gathered a great deal of interesting and instructive data. Core oils are being investigated at the University of Michigan. Foundry costs are receiving more and more attention, and it is confidently expected that the persistent propaganda carried on by the Association will result in more uniform methods and sounder pricing.

The Institute of Metals Division plans to co-operate with the American Society for Steel Treating in bringing out data sheets for distribution to the membership of both organizations. Dates of meetings of the Institute will be arranged to allow for the changes decided upon by the American Foundrymen's Association. The next meeting of the latter, in Chicago, June 7-9, 1927, will be only a technical meeting and no exhibit will be held until 1928.

ECONOMIC DEVELOPMENTS

Copper continues to surprise even its adherents by its steady and uninterrupted increase in the quantities absorbed and the new fields entered. The consuming industries continue to grow. Electrical manufactures, the backbone of copper consumption, moved ahead steadily. The automobile industry has refused to submit to the predictions of a long decline, as have electrical refrigeration, washing machines and lighting fixtures. Experimental work with locomotives equipped with copper fire boxes

and tubes, and other experiments with copper-protected with marine piling are said to promise satisfactory results, assuring increased consumption of copper in these lines.

Zinc is the object of much conscientious work by the American Zinc Institute in standardizing coatings and spreading the use of pure zinc sheet. One result is that zinc-coated steel garages have increased greatly in number. Specifications are being worked out for zinc-coated iron and steel products, ranging all the way from tacks to the hulls of vessels.

New fields for aluminum have been opened so often, that it is almost monotonous to mention them every year. The latest steps of consequence are the steady growth of all-metal airplanes; the increased use of aluminum for large dirigibles; aluminum railroad cars and furniture.

Nickel has been the infant wonder of the metal world for the past five years. From a material dependent largely upon armament it has changed to an important addition agent in foundries, both iron and metal, and a widespread fabricated material in sheet and rod, for kitchens, laundries, food products, factories, etc. Monel metal, the most important alloy of nickel with the exception of nickel-silver, continues to spread in every form.

Silver suffered from the great blow of demonetization in India and has its problems still to work out. It must go through the same hard development period as did copper and nickel after war demands ceased. We can only recommend, as we have done before in these columns, co-operative effort of the silver producers and manufacturers.

One of the great aids to American industry is the friendly co-operation and assistance offered by the Department of Commerce. To cite one example, this department, through its work on standardization has reduced styles, sizes, grades in brass sink traps by 94 per cent. This is only one of the industries helped in this fashion. Of indirect, although considerable value, to the metal trade is the work of the Bureau of Foreign and Domestic Commerce which, with an expenditure of $3,000,000, secured for American exporters new foreign business approximating $190,000,000.

The platinum situation, due to the various impurities found in the commercial alloys, has become complicated to a point where the dealers in this material have asked for a law regulating platinum standards. This would be a long step in the right direction and help to simplify the problems of dealers, manufacturers and the public.

A dramatic move was made by Henry Ford in the institution of a five-day week in all of his plants. The step is still too recent to allow for authoritative or even accurate opinions as to its feasibility throughout American industry. It is well known that the Ford organization can do some things that others cannot, due to peculiarities of its industry or of its own local conditions. However, it is a most important stand taken by one of the leading American industrialists. Whether it will be a guide to others or simply the gesture of an individual only time can tell.

NECROLOGY

Among the men of prominence in the metal industry who passed away during 1926 were the following:

Dr. Karl Goldschmidt, inventor of the Thermit process.

Daniel M. Brady, president, Brady Brass Company, Jersey City, N. J.

Mark L. Sperry, formerly president Scovill Manufacturing Company, Waterbury, Conn.

Franz Roessler, president, Roessler and Hasslacher Chemical Company, New York.

George M. Van Deventer, treasurer, Waterbury Clock Company, Waterbury, Conn.

Ferdinand Deming, rolling mill engineer.

Edmund N. Todd, chairman, board of directors, Hanson and Van Winkle Company, Newark, N. J.

A. B. Seelig, vice-president, Michigan Copper and Brass Company, Detroit, Mich.

U. T. Hungerford, chairman of the board, U. T. Hungerford Brass and Copper Company, New York.

Cleveland H. Dodge, chairman of the board, Phelps-Dodge Corporation, New York.

Colonel Washington A. Roebling, president, John A. Roebling's Sons Company, Trenton, N. J.

George K. Elliott, past chairman, Institute of Metals.

Howard H. Franklin, president, Franklin Die Casting Company, Syracuse, N. Y.

Howard J. Rowland, secretary, Rome Brass and Copper Company, Rome, N. Y.

E. M. Squier, vice-president, New Jersey Zinc Co.

Charles F. Brooker, chairman of the board of directors, American Brass Company, Waterbury, Conn.

OUTLOOK FOR 1927

The best methods of judging the prospects for the metal trades, so far as we know, is to find out the prospects of the trades upon which they are dependent. These seem to be almost unanimous in looking forward to another good year. Prominent electrical manufacturers are confident that their business will be as good, if not better. Automobile companies, such as the General Motors, Studebaker, and others, are planning for an expansion rather than curtailment and these are known to be good judges of the market. Henry Ford has enough confidence that 1927 will be normal to stick to his old type of car rather than make any radical changes. Bankers seem to be unanimous in predicting a prosperous year. The feature of heavy installment buying which worried them last year seems to be less troublesome now, possibly because it is being held within bounds. The Dupont group expect that their business in the next 12 months will run somewhat better than during the current year. Railroad presidents look forward to results in 1927 that will compare favorably with those in 1926. E. B. Leigh, president of Chicago Railway Equipment Company, is of the opinion that railroad buying in 1927 is likely to make up for any slump which may come in building or automobiles.

Perhaps the best general consensus of opinion as to the coming year is that published by the National Association of Manufacturers. This organization is markedly optimistic and it gives the following reasons for its optimism:

1. Business is nearer to a cash basis than ever.
2. No financial panic can come because the Federal Reserve System stands as an indestructible buffer.
3. The industries are operating at a high rate of production.
4. The margin of profits has been narrowed and we are closer to a true relationship between costs and sales.
5. Competition will be stronger.
6. Credits have decreased and there is ample money.
7. People generally are contented and there are fewer disturbances.

If any one indicator is needed of the confidence of conservative and careful business leaders in the future, the action of the United States Steel Corporation in declaring a 40 per cent stock dividend fills that need. This dividend, although paid of course out of past profits, is nevertheless a mortgage upon future profits, being paid in stock instead of cash. In other words, it is more than a disbursal of past earnings; it is a promise for the future, and this, from such a balanced, conservative organization as the one headed by Judge Gary, is more than reassuring.

THE METAL INDUSTRY enters its 25th year with the belief that it shows every promise of being a good year. If agricultural markets improve, it is likely to be one of the biggest years in our history.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

MAGNETIC SEPARATION OF METALS

To the Editor of THE METAL INDUSTRY:

On page 325 of your August issue is described a method of using a magnetic separator to remove iron from Monel metal turnings, by introducing a rheostat to weaken the magnetic action to that point at which the iron will be retained and the less magnetic nickel alloy rejected by the machine.

The separator shown there in the illustration appears to be a belt and pulley machine, in which the iron is held magnetically to a belt while the feebly or no-magnetic material falls off.

A similar result can be obtained with another standard type of separator, in which the mixed metals are allowed to travel down an inclined shaking table maintained at a fixed but adjustable distance below a more or less horizontal revolving disc carrying electromagnets. By adjustably increasing the gap between the disc and the shaking table, the magnetic field through which the material passes may be weakened until the best position is found, so that the magnets will pick up and carry away the iron and leave the Monel metal undisturbed.

The writer used the latter method five or six years ago with considerable success, and the separation, though less complete than with bronze, was quite satisfactory. The Monel metal upon which the disc machine was used consisted mostly of drops or spills recovered from foundry sand, and these were somewhat irregular in their magnetic behavior. It was noticed that though most pieces were only feebly magnetic there were exceptions, so that a few particles, more magnetic than the average, went with the iron.

If the machine had been arranged to treat material heated up to the temperature at which Monel metal becomes non-magnetic, a still cleaner separation would have resulted and it would have been possible to use a stronger magnetic field.

The two types of separator are similar in principle, but the mode of action is not identical. With the belt machine the mixed metals are subjected at once to the strongest part of a weak magnetic field; the iron is there retained and the nickel alloy drops out of the field when the belt travels around the magnetic pulley. With the disc machine the mixed metals are subjected to the weaker part of a strong magnetic field; the iron jumps across the gap into the strong field and is removed by the revolving disc and the less magnetic material passes on down to the end of the machine.

Whether any advantage attaches to one or the other type of separator may be doubtful, in the lack of comparative tests, but the presence of the stronger field into which the iron is drawn, in the case of the disc machine, might conceivably offer a limited advantage, in that once a magnetic particle started to respond, its first small motion would bring it into a stronger field and the action then would become more positive. Another possible advantage for the disc machine might be the fact that the material is subjected twice to a magnetic field, first when it passes into the area beneath the disc and again when it passes out on the other side. Also, during the passage of the material between these two points the shaking motion of the table has changed the relative positions of the metal particles, so that pieces entangled or hooked together may have been shaken apart before passing through the second field, thus making possible the removal of iron that was not taken out the first time.

Newark, N. J. ROBERT F. WOOD.
November 1, 1926.

ZINCING VS. GALVANIZING

To the Editor of THE METAL INDUSTRY:

Let me thank you for your December editorial on "Zincing vs. Galvanizing." It is true to form.

American business men boast of their readiness to accept the latest if they are convinced that it is the best. This may be true in respect to machinery and methods, but it is not always true when it comes to their correct use of designations in their own business.

Neither business men nor authors have the moral right to mask the product of an important industry behind misleading or mystifying names.

It is true that custom makes language, but when a leading industry is robbed of a valuable advertising advantage and dictionaries persist in saying that the word "galvanizing" is improperly used, it is about time that prejudce should yield to reason.

"Galvanizing" is no more a part of the title of a modern book on Zincing than would be "Spelter" if used in the title of a book on the Zinc industry of today.

If Mr. Flanders re-writes his book with the ancient title of "Galvanizing and Tinning," he will, in my opinion, unnecessarily limit its sale, and, therefore, its usefulness. This, for the reason that in doing so he will show a stand-pat attitude that bodes ill for the modernization of a book that, until recent times, has been considered an authority on the subject of Zincing and Tinning.

If Mr. Flanders does not decide to re-write this book at an early date, he should promptly delegate the work to someone qualified to do it. The book, as you know, is now out of print. Many calls are received for it nowadays, because of a tendency to increase the number of smaller zinc coating units throughout the country. Personally, I have several times offered twice the list price for this book, without success.

I am glad to see that Mr. Flanders agrees that the word "Zincing" is a more appropriate term than "Galvanizing." However, I disagree with him when he says that "nearly all of the processes are generally known as galvanizing." Hot Zincing, Electro Zincing, Vapor Zincing and Spray Zincing have separate and distinct uses. Price factors also govern their respective uses. Mr. Flanders admits that he has had occasion many times to explain that the process known as "Galvanizing" was in reality "Zincing." As your journal pertinently says "We have the art of Tinning. Why not of Zincing?"

Respecting a technical authority in this matter, I believe that, so far as Zinc is concerned, I am free to say that the Zinc industry most heartily welcomes the use of the honestly descriptive terms which you advocate, and the national organization of the industry will do everything in its power to bring such terms into general use.

December 22, 1926. STEPHEN S. TUTHILL, Secretary,
American Zinc Institute.

GOVERNMENT PUBLICATIONS

Platinum and Allied Metals in 1925. By James M. Hill. Bureau of Mines, Washington, D. C. Price 5 cents.

Bauxite and Aluminum in 1925. By James M. Hill. Bureau of Mines, Department of Commerce, Washington, D. C. Price 5 cents.

Arsenic in 1925. By V. C. Heikes. Bureau of Mines, Department of Commerce, Washington, D. C. Price, 5 cents.

Antimony in 1925. By J. W. Furness. Bureau of Mines. Department of Commerce, Washington, D. C. Price, 5 cents.

Annual Report of Director of the Bureau of Standards for Fiscal Year Ended June 30, 1926. Bureau of Standards, Department of Commerce, Washington, D. C.

Graphite in 1925. By Jefferson Middleton. Bureau of Mines, Washington, D. C.

Sterling Silver Flatware. Simplified Practice Bulletin No. 54, Department of Commerce, Washington, D. C. Obtainable from the Superintendent of Documents, Washington, D. C. Price 5 cents.

A Primer of Simplified Practice. By Ernest L. Priest, assistant chief business specialist, Division of Simplified Practice. Washington, D. C. Price 15 cents.

New Books

The Brass Founders' and Finishers' Manual. By Philip Gates. Published by Crosby, Lockwood & Son. Size, 5 x 7½. 172 pages. Price, payable in advance, $2.00. For sale by THE METAL INDUSTRY.

BY W. L. ABATE
Mechanical Editor

As its name implies this is a treatise of the art of producing finished brass parts. The book was written in England and many of the terms and methods used are different from those in use in the United States.

Each chapter deals with a separate operation of the procedure. Beginning with Chapter I we find why patterns are necessary and the general method of manufacture of these important items of expense. The description applies seemingly to patterns of large size and not so much to mass production work, although there is an article on plate patterns, for use on molding machines, where the patterns are mounted on one side of the plate only. The sketch, however, shows patterns on both sides of the plate and this is just a little confusing to the amateur although more easily understood by the expert. Patterns were made or mounted on both sides of a plate, for use in the ordinary brass founder's flask before molding machines came into use and they are still being made.

Chapter II contains some good information on alloys and mixtures along with a number methods of treating the metal while melting.

Chapter III treats of the foundry work proper and is a good general description of this branch of work. It includes the various kinds of sand used for molding and core work, the boxes (or flasks as we term them) a description of the various kind of molders hand tools and their use; a short article on crucibles and a longer one on core making. We note the word 'Sprigs" used as applying to "core wires." We do not find any reference to the use of "core dryers" as forms, used for holding the cores while in the process of drying.

The article on furnaces is strongly in favor of the gas-fired type which is probably due to the cheapness of this class of fuel over others. The argument on different types of fuel is evidently going on over there, as it is here. The article of G. Bernard Brock quoted at this point in the volume, while technical to an extended degree, is not a good reference for guidance in the operation of melting. The furnaces used were not balanced in size for such a test. The melt covered a period of 14 hours of continuous operation with charges of 30 lbs. each, 2,220 lbs. being melted; 24 heats being taken out of the coke furnace with a consumption of 720 lbs. of coke or about 3 lbs. of metal to 1 lb. of coke. This, of course, is out of all proportion to regular practice. We surmise that the melt was made in a regular size foundry furnace, using a very small pot for the 30 lb. charge, with a charge of coke large enough properly to fill the furnace, but unnecessarily large for the metal being melted. The comparative record shows fuel consumption cost for coke 8.6d, oil 15.3d, gas 3.8d, for each 100 lbs. of metal or 66 lbs. of coke, 4.1 gals. of oil, 383 ft. of gas for use in each of the furnaces. We know of records of melt where less than 60 lbs. of coke produced 450 lbs. of metal. The zinc loss was less in the coke fired furnace, as is to be expected owing to the lower draft necessary.

The chapter on molding is good and covers many branches of the art. A statement that the use of risers is for the purpose of only to advise the molder when the flask is full is not in line with our practice here. We use the riser for a different purpose entirely.

A good description is given of the Tabor molding machine with its adaptability for use on various kinds of work, showing the amount of time saved on each operation.

An article on foundry scrap or "wasters" and the cleaning and sandblasting of castings complete the foundry section.

Chapter IV is a most interesting one, dealing with the brass finishing part of the art and the tools that are necessary for this work. Of particular interest is that part that deals with the kinds of steel most adaptable for finishing brass work. With reference to high speed steel we quote as follows: "High speed steel is specially alloyed to work at maximum speed and with heavy feed, but its nature is such that in most cases the production of a fine cutting edge is not possible. Therefore, it is seen at its best where heavy work is to be done. For the roughing of castings, where there is sand and scale to contend with or for very heavy roughing cuts it will prove quite satisfactory. Where, however, a fine finish is required there is still a call for steel."

We heartily agree with the above statement and particularly so where threading chasers are concerned. These should always be made of cast steel for use on brass.

There is a long article on thread cutting tools and methods well worth while reading, although they apply mostly to the engine lathe. We do not find any reference to the Fox lathe or its equipment and surely the interested reader should know about this most flexible machine and its work. There are descriptions of speed lathes and their duties, so-called squaring machines and drill presses.

Short articles on cleaning, polishing and buffing (the buffs being called mops), bronzing and lacquering and finally soldering, complete the book. It is all interesting reading to the expert and should be instructive to the Amateur.

Procedures in Employment Psychology. By W. V. D. Bingham and M. Freyd. Published by A. W. Shaw Company. Size, 5½ x 8, 269 pages. Price, payable in advance, $5.00. For sale by THE METAL INDUSTRY.

To industry at large, and particularly to large companies, the problem of employment methods and procedure is of utmost importance. This importance is now more generally recognized than ever before. What is comparatively new is the use of the science of applied psychology to aid in such work, and this is the field covered by the book.

It is essentially a manual outlining the procedure for developing, evaluating and installing measurement methods in vocational selection. As such it is at once technical and practical giving the details of the actual work to be done with or through experienced employment psychologists.

An idea of the scope of the book can be gained from the subjects covered, among which are the following: Job Analysis; Analysis of the Worker; Selection of Examination; Psychological Tests; Rating Scales; Questionnaires; Validation of Measuring Instruments; Prediction of Vocational Success; Economic Value of the Examinations.

Arc Welding. Published by the Lincoln Electric Company, Cleveland, Ohio. Size, 6 x 9, 160 pages. Price, $1.50.

This book is devoted largely to the use of arc welding in general production manufacturing. It contains more than 200 illustrations and numerous diagrams and charts.

There are two main fields for production welding; arc welding in place of riveting and the substitution of arc welded steel for cast iron. The book is strongly in favor of welding steel as against cast iron, making the statement that 90 per cent of the iron castings now used can be replaced by arc welded steel at a decided saving.

Among the subjects covered, as noted by chapter headings are the following: Steel versus Cast Iron; Arc Welding Makes Riveting Obsolete; What Arc Welding Is and What It Does; Other Methods of Welding; Arc Welding in General Manufacture; Strength of Arc Welded Joints; The Speed and Cost of Welding; Automatic Arc Welding.

Forecasting, Planning and Budgeting in Business Management. By Percival White. Published by McGraw-Hill Book Company. Size 5½ x 8, 267 pages. Price, payable in advance, $2.50. For sale by THE METAL INDUSTRY.

This book is a manual on modern practice in business planning. It is, in a sense, a text book covering this subject from the sources and theoretical aspects to practical applications. The book discusses the source of data, factors in forecasting, and the application of statistics to specific businesses and departments.

Considerable space is devoted to the technique of statistical preparation both in tabular and graphical form. Chapters are also included on financial planning, purchasing, production and marketing. In a word, this work can be called a text book of business management.

The book is unusually well written and in addition to its technical and practical value, is extremely interesting reading. It can be recommended for a place in every business library.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

BAGGED NICKEL ANODES

Q.—I would like to have you answer a few questions, as listed below:

1. Is it practical to use bagged anodes on automatic nickel plating solution?
2. Are they in use now?
3. Do you know of any place?
4. What results do they get?
5. For what purpose do they use bagged anodes?
6. What kind of a cloth gives best results?
7. If bagged anodes are obsolete, what would you suggest as a means to keep anodes and tank clean; tank, 48 feet long and six rows of anodes.

A.—We are pleased to answer your several questions as follows:

No. 1. Bagged nickel anodes are seldom used nowadays in any type of nickel plating solution. Anodes of soft rolled nickel, 99% plus, containing practically no inert factors are coming into universal use, especially if the solutions are operated at 90 deg. F. or more.

No. 2. As above.

No. 3. Yes, in Peru, Ill.

No. 4. Excellent results for their particular purpose when scrap nickel is used.

No. 5. To prevent the disintegrated carbon from entering the solution from the anode.

No. 6. Gunny sack cloth or burlap.

No. 7. Boiling out occasionally for an hour; then scrape off the carbon coating with a sharp edged tool or scraper. The anode will then be mechanically clean.—C. H. Proctor. Problem 3,594.

BLACK ON ALUMINUM

Q.—Can you kindly advise us whether there is a formula, either in electro plate, or dipped, for placing a black deposit on cast polished aluminum, somewhat similar to the oxidizing on copper plate? Also, can you state, whether it is possible to mix any stone substance in aluminum whereby its color can be changed to make it darker?

A.—It is difficult to obtain a successful black deposit upon aluminum, either bright or satin finished surfaces, by any other method than with a black nickel solution adapted for the purpose. The following solution will give the desired results:

Water	1 gal.
Nickel chloride	6 ozs.
Sal ammoniac	6 ozs.
Common salt	2 ozs.
Rochelle salts	1 oz.
Zinc chloride	¾ oz.

Prepare the solution by dissolving the materials in the order given in the water at 120 deg. F. Then allow the solution to cool down to 80 deg. F. It will then be ready for operation, with nickel anodes at ½ to 1 volt.

There is no method or chemical that we know of that can be added to molten aluminum to darken its color.— C. H. Proctor. Problem 3,595.

BLUE FINISH ON STEEL

Q.—Would you kindly advise me how to put a blue finish on steel revolvers.

A.—To produce a true gun metal blue on revolvers, proceed as follows:

1. Remove the old finish and rust by immersing the parts in a mixture of 1 part muriatic acid and 2 parts water, heated to 120 deg. F.

2. As soon as the old finish and rust are removed, wash the parts thoroughly in cold and hot water. Immerse in gasoline and dry with a cloth.

3. Polish the surface with a Tampico brush wheel and 180 emery cake. If the surface of the parts is rough, then polish under usual methods. After polishing, wash the parts in gasoline and dry thoroughly.

4. In an iron pot of sufficient dimensions place sufficient sodium nitrate to completely cover the parts. To every pound of the salt add ½ oz. black oxide of manganese. Heat to 700 deg. F., then immerse the revolvers in the molten salt solution until they become a blue black. Remove, wash and dry in cold and boiling hot waters, then apply a thin coating of floor wax or linseed oil and wipe to a lustre with Canton flannel. Be careful not to get any moisture in the molten salt bath. It is advisable to heat the steel parts to be treated to about 200 deg. F. before immersing them to avoid the re-action between the cold metal and the molten salt.—C. H. P. Problem 3,596.

BOWER BARFF FINISH

Q.—We would appreciate very much getting information from your valuable magazine, to which we have been subscribers for many years; information as to the process and equipment required to make Bower Barff finishes on iron goods, particularly for the Bower Barffing of door knobs and escutcheons in builders' hardware business.

A.—The production of the Bower Barff finish consists of first, sand blasting the steel surfaces to produce a clean even surface; second, heating in a closed retort to 1150 deg. to 1200 deg. F., for several hours (minimum two hours). During the heating period superheated steam is injected into the retort. The resulting surface obtained is the black magnetic oxide of iron which is the most perfect rustproof black finish obtainable.

After the articles have cooled down to a normal temperature they should be oiled with linseed oil, colorized with black Nigrosine, soluble in benzole. Make a saturated solution of black nigrosine and benzole, then add proportions to the linseed oil to produce a black tone; finally heat slowly to dry the oil coating.

Many years ago the Bower Barff process was improved by the Bradley and Bon-Tempi patents, now expired. The improvements consisted in injecting, with the steam, a hydrocarbon such as benzine or benzole. The results was a greater depth of penetration in the steel.—C. H. Proctor. Problem 3,597.

BURNED COPPER AND NICKEL DEPOSITS

Q.—My nickel tank is lead lined and is run warm. It is 48 in. deep, 72 in. long and 24 in. wide. I am plating or supposed to place in this tank 20 tubes, 3 in. in diameter and 50 in. long. It is run as a double tank, 3 rods of anodes and 2 rods of work, and as the work does not carry exactly straight it burns. Don't you think my tank is quite too narrow and that a tank of this width should be used as a single one? I am using the following solution, one with which I have never had any experience, using 99% anodes: single nickel salts, 10 ozs.; nickel chloride, 2 ozs.; boracic acid, 2 ozs.; sal-ammoniac, 1 oz.; Epsom salts, 1 oz. I believe it would be better if I made it a single tank, and did not get so close to the anodes with the work.

The copper tank is fitted up with 5 rods, 3 anode and 2 plating. I am experiencing the same trouble as with the work as the nickel tank. What voltage would you recommend for best results, also time allowance in tank? I am running a generator at 6 volts and 1,000 amperes. How many amperes should register with the voltage required on this work? Are 5 volts too many with this load and 100 amperes registered on ammeter? What length of time would be best to run such batch of work as I mentioned above?

My copper formula is sodium cyanide, 4 ozs.; copper cyanide, 4 ozs.; bicarbonate of soda, ¾ oz.; bisulphite soda, ½ oz. Do you think sulphate of copper would be better for outside work as a rust preventive in general?

A.—Your tank is not wide enough for the maximum results in hot nickel plating your product. It should be at least 40 inches wide so as to allow a distance of 8 to 9 inches from the anode to the cathode or tubes plated on both sides. Unless you can make a change in your tank it would be advisable to operate it as a one cathode rod tank with two rods of anodes. The formula you mention is an unusually good one for a cold or normal temperature solution. As a hot nickel solution formula, the single nickel salt content is too low; increase it to 24 ozs. per gallon. Occasionally add a little acetic acid to the solution, about 1/16 oz. per gallon a day. The surface area of the 20 tubes, 3 in. in diameter and 50 in. long is about 67½ sq. ft. With an increase in nickel salts as outlined and an increased distance between anode and cathode, the minimum amperage at 4 to 5 volts should be 700 amperes. If you only consume 100 ameres, then under correct conditions you should be able to increase the rate of deposit 600% in the same time you now plate the tubes.

Your copper solution formula is satisfactory except that the cyanide content is low; increase by 1 oz. per gallon. The addition of ½ oz. bisulphite of soda and ½ oz. caustic soda should improve the deposit. As a brightening factor add 1 oz. hyposulphite of soda per 100 gallons of solution. The distance between the anode and cathode in a copper cyanide solution does not make as much difference as in a nickel solution, but an increase in the distance over the present would be advantageous in your copper deposit. For maximum resistance to atmospheric corrosion, plate first in the nickel solution for 5 minutes, then in the copper solution for the same time and then in the nickel solution for 30 minutes at 10 amperes per sq. ft. of surface or as you may deem advisable. Alternating deposits of nickel, copper and nickel are now deposited extensively as rust resisting factors in nickel plating on steel.—C. H. P. Problem 3,598.

GREEN ON BRASS

Q.—Please give me information on green finish on brass without oxidizing brass surface first.

A.—We would suggest that you look in "Platers' Wrinkles" under the heading of Verde Greens and you will find several formulæ adapted for your purpose. Or the following solution may be used to advantage:

Muriatic acid	1 quart
Acetate of copper	3 lbs.
Copper carbonate	8 ozs.
Sal-ammoniac	3 lbs.
White arsenic	8 ozs.

This is a heavy paint-like solution. Apply with a round sash brush, rubber-set. When the green is dry then wax the surface with beeswax and turpentine paste or floor wax.

To prepare the solution, heat the muriatic acid to 120 deg. F. Dissolve the arsenic therein, then add the balance of the materials. If too dense, then reduce with a little water. Brush the brass surface with a stippling motion for best results.—C. H. P. Problem 3,599.

PLATING POROUS BRONZE CASTINGS

Q.—We are experiencing considerable trouble gold plating Tobin bronze that is subject to acid fumes, it being impossible to plate over small pores in the metal. Is there any way of cleaning these pores so that a complete covering of gold or platinum will result? The test is to boil the weights in distilled water for one hour. The pores are about .002 or .003" dia. and the manufacturers of the bronze claim it is impossible to eliminate this difficulty.

A.—It is almost impossible to plate over a porous spot in any type of base metal because electro-deposits will not bridge the porous spot, even in Tobin bronze. You might try acid dipping the metal in an acid dip composed as follows:

Nitric acid 38° 1 gallon; surphuric acid 66° 1 gallon; water 1 pint; muriatic acid 1 oz. Mix the acids in the order given and use when the acids become normal temperature. Dip the cleansed Tobin bronze in the acid for a moment or two, then remove and wash thoroughly in cold water. Immerse in a cyanide dip as follows: water 1 gallon; sodium cyanide 96-98% 2 ozs.; temperature 160 deg. F. for a moment, then wash in cold water and gold plate as usual. We believe the methods will cleanse the pores and enable you to deposit gold in them. The alternative would be to fuse pure tin solder in the pores then smooth down and gold plate.—C. H. P. Problem 3,600.

SPOTTING OUT

Q.—I am having some trouble with my plating and would like your advice. I am plating cast iron floor lamps with brass. First I used to plate them in cyanide copper for a few minutes and then I put them in a brass solution, and ran them for 45 minutes. When I took them out of the brass bath I had it colored and it was very good, but when they were lacquered, stains would come out. Then I tried to acid copper plate them. I plated them in a cyanide copper solution and then took them out and rinsed in cold water and ran it 35 minutes in the acid copper solution. Later I ran it in the brass for 35 minutes and when it became colored it looked good, but after being lacquered, stains would show again. Please advise me what to do in this case as soon as possible.

A.—Your spotting out problem is the same old problem that platers have had to contend with for years, especially in the humid summer months. If you nickel plated the cast iron lamp base previously to brass plating, the change would help the spotting out to some extent, but may not entirely eliminate it. Try the following method: After plating the cast iron bases as usual, wash them in cold water. Then immerse them in boiling water to which is added at least ½ oz. black platers compound per gallon of water. Let the bases remain in the boiling soap solution for at least 1 hour, then remove, dry out and heat in a lacquer dryer for a short time. Arrange if possible to do the final finishing on the bases the following day. You should then eliminate the spotting out.—C. H. P. Problem 3,601.

TIN SOLUTION

Q.—We have been nickel plating malted milk dispenser parts that are made of white metal die castings and the inside working parts are made of steel. Our customer wants to have us electro-galvanize the inside parts but first wants to know if the galvanized parts, on account of their being in the malted milk will corrode and form a poison of some kind.

We also wish to inquire if you think any corrosion or action of any kind will take place on the inside of the white metal die casting as the malted milk lies directly on the inside of this casting?

A.—Zinc or cadmium should not be deposited upon any article made of metal which is used in connection with food, especially milk products. Lactates of zinc and cadmium would be formed, due to lactic acid in milk. These would be, in a measure, poisonous. Nickel protects die castings from the action of the lactic acid to some extent. Silver or tin is the logical metal to deposit upon steel, brass or die castings for milk or milk product dispensers or containers. Cadmium would protect the steel from corrosion. A deposit of tin would protect the cadmium from the action of the milk products. You can prepare a tin solution as follows, that will give you a heavy deposit of tin in a few minutes. If, after tin plating the articles, you dry them out thoroughly, then scratch-brush them dry with a soft brass wire scratch-brush.

Tin solution:

Water	1 gallon
Sodium stannate	28 ozs.
Tin chloride	1 oz.
Powdered yellow resin	⅛ oz.

Temp. 160-180 deg. F.

Anodes: sheet steel and pure tin; surface area 50-50. The steel anodes should touch the tin or be connected to them. Voltages 4 to 5.—C. H. P. Problem 3,602.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,606,159. November 9, 1926. **Process of Producing Protective and Resistant Coatings.** Colin G. Fink and Li Chi Pan, New York, N. Y., assignors to Chemical Treatment Company, Inc., New York, N. Y.

A method of producing protective and resistant coatings of metals which are discolored and oxidized when heated in air, comprising plating a foundation-metal with the protective metal, and immersing the plated metal article in a molten bath of lead to eliminate "pin-hole" defects in said plate by heat-treatment, without producing discoloration of said protective metal.

1,606,616. November 9, 1926. **Alloy.** Frederick P. Dustan, Buffalo, N. Y., assignor to John Walrath, Salamanca, N. Y.

An alloy composed of the following ingredients combined in about the proportions specified: aluminum, eighty-four pounds; tin, ten ponnds; zinc, six pounds.

1,606,618. November 9, 1926. **Enamel Remover.** Carleton Ellis, Montclair, N. J., assignor to Chadeloid Chemical Company, New York, N. Y.

An enamel remover comprising approximately equal parts of benzol and a saturated solution of caustic soda in denatured alcohol.

1,606,619. November 9, 1926. **Baked Japan Remover.** Carleton Ellis, Montclair, N. J., assignor to Chadeloid Chemical Company.

A baked japan or enamel remover comprising benzol, denatured alcohol, caustic potash in such amount as to form a relatively concentrated solution with the quantity of alcohol present, and paraffin wax, in the form of a mixture which, except for the turbidity caused by the wax is homogeneous.

1,606,752. November 16, 1926. **Light-Metal Alloy.** Herbert H. Dow and John A. Gann, Midland, Mich., assignors to the Dow Chemical Company, Midland, Mich.

As a new product, an alloy containing magnesium and zinc, wherein the magnesium largely predominates and the zinc is all in solid solution, the amount of such zinc being less than 0.50 per cent.

1,607,245. November 16, 1926. **Manufacture of Metal Alloys.** Emil Duhme, Berlin-Charlottenburg, Germany, assignor to Siemens & Halske Aktiengesellschaft, Siemensstadt, Berlin, a corporation of Germany.

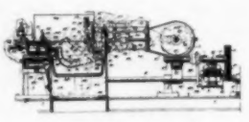
The process for the manufacture of metal alloys which consists in mixing the metals to be alloyed with mercury into a amalgam and subsequently removing the mercury again from the amalgam and then melting the porous alloy product into a solid mass.

1,607,676. November 23, 1926. **Process for Obtaining Metal Coatings on Articles of Aluminum and Aluminum Alloys.** Bohumil Jirotka, Berlin, Germany, assignor to the firm Dr. Otto Sprenger, Patentverwertung Jirotka mit beschränkter Haftung, Vaduz, Liechtenstein.

The process for producing metal coating on aluminum or aluminum alloy without substantial previous cleaning which comprises subjecting a surface thereof without application of electric current to the action of an aqueous liquid to which has been added a bicarbonate of an alkali metal and a simple salt of a metal which is electronegative to aluminum.

1,607,677. November 23, 1926. **Die-Casting Machine.** Torbjorn C. Korsmo, Madison, Wis., assignor to Madison-Kipp Corporation, Madison, Wis.

The combination in a die casting machine of a die; a pressure-chamber for conducting molten metal to the die; and means for furnishing to said pressure-chamber a pressure fluid, of a temperature approaching that of the molten metal, to act directly upon the molten metal and force it into the die.



1,607,850. November 23, 1926. **Plating Machine.** William Fford Service, New Britain, Conn.

In a plating machine, a plating tank, a conveyor for supporting work and having a portion that co-operates with said tank, supporting and guide devices for said portion, and said devices being distributed relatively to said portions so as to provide a plurality of return bends.

1,607,960. November 23, 1926. **Method and Means for Electro-Depositing Nickel Metals and the Resulting Products.** Charles P. Madsen, New York, N. Y., assignor to Madsenell Corporation, New York, N. Y.

The method of electro-depositing "nickel metals" which comprises using a "nickel metal" electro-deposition bath containing an iron compound or compounds and maintaining the bath during electro-deposition substantially free from iron compounds in the ferric condition, whereby the deposited metal is substantially free from pits.

1,607,994. November 23, 1926. **Means for Electrodepositing Metals.** Charles P. Madsen, New York, N. Y., assignor to Madsenell Corporation, New York, N. Y., a corporation of New York.

The method of electrodepositing "nickel metals" which comprises treating the electrodeposition bath with chlorine to oxidize organic matter present in the bath.

1,608,250. November 23, 1926. **Plating Method.** Robert Jay Shoemaker, Chicago, Ill., assignor to Leadizing Company, Chicago, Ill.

Method of plating a metal article which consists in covering the article with a coating of lead, and then superposing on the coating thus formed a second coating by electrolysis.

1,608,694. November 30, 1926. **Corrosion-Resistant Article and Method of Making the Same.** John R. Cain, Washington, D. C.

An article of manufacture comprising a base metal of the kind known as stainless steel or iron having a corrosion resistant coating possessing the properties of chromium.

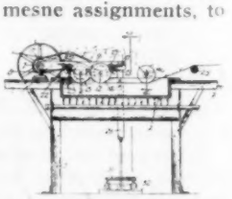
1,608,706. November 30, 1926. **Electroposition of Metals.** Charles P. Madsen, New York, N. Y., assignor to Madsenell Corporation, New York, N. Y.

In the electrodeposition of "nickel metals," a bath comprising a salt of a "nickel metal" in solution, and a finely divided hydrate of a "nickel metal" in suspension therein.

1,608,775. November 30, 1926. **Process for Coating Metals.** Samuel Daniels and Arthur C. Zimmerman, Dayton, Ohio.

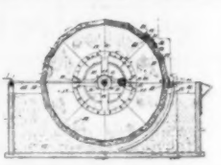
The process of treating metals to form a protective coating thereon, comprising applying a coating of a silicate solution to the metal, dehydrating the coating and subsequently neturalizing the coating by treating with a dilute solution of an acid.

1,608,855. November 30, 1926. **Tinning Machine.** Joseph D. Harris, Detroit, Mich., assignor, by mesne assignments, to McCord Radiator & Mfg. Co., Detroit, Mich.



In a machine for coating metal band or ribbon stock with metal, the combination with a bath of molten metal, of means adjacent the inlet end of the bath for guiding said band into the same, a pair of inner and outer smoothing rolls held out of gripping engagement with the band and located at the delivery end of the bath.

1,609,357. December 7, 1926. **Electrolytic Plating Machine.** Josef Hulmer, Chicago, Ill.



An electrolytic plating machine including a solution tank; a rotable shaft on the tank; a tumbling barrel carried by the shaft for turning through the solution within the tank; a cathode arranged on the inner periphery of the barrel; and anodes carried by the shaft and comprising separate clamping wheels.

1,609,882. December 7, 1926. **Process of Treating Zinc Waste.** John Nevin Pomeroy, Philadelphia, Pa.

The process of treating zinc waste containing a high chloride content to lower such content, which comprises mechanically separating out the metallic zinc, subjecting the material thus treated to the action of sulphuric acid to remove the greater portion of the chloride content, and then roasting the material to volatilize out further of the remaining chloride content.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

LAWTONITE REFRACTORIES

The Jonathan Bartley Crucible Company of Trenton, N. J., has for distribution a booklet, entitled "Lawtonite Refractory Facts," containing guaranteed reports of various users of this brand of refractories. Among these reports is one by the A. C. Nielsen Company of the operation of an installation in the Bohn Aluminum and Brass Corporation of Detroit, Mich. In this plant the conclusions reached were as follows:

1. Bohn Aluminum and Brass Corporation, Detroit, has standardized on Lawtonite electric furnace linings.
2. Use seven 1-ton electric furnaces of the Detroit oscillating type.
3. Lawtonite lining withstands temperature changes and has high physical strength.
4. Lawtonite lining lasts 230 days. Previous lining lasted 77 days.
5. Refractory cost per ton is 44 cents as compared with 60 cents per ton for previous lining.
6. 25% reduction in refractory cost saves $291.20 per furnace per year.
7. Less time for re-lining results in 6.8% increase in production.

ENAMELING FURNACE OPERATION

The following is a summary of the findings by the A. C. Nielsen Company in the plant of the J. L. Mott Company of Trenton:

1. Lawtonite brick stand up in oil burning enameling furnaces.
2. Temperature reaches 2,300° F.
3. Ordinary fire brick lasted only 3 or 4 months under oil firing conditions.
4. Lawtonite brick have life of 1 to 1½ years.
5. Cost of rebuilding reduced $499.75 per year.
6. Fewer re-buildings result in saving of additional furnaces.
7. Total annual saving amounts to $994.13.

SHERWOOD BRASS WORKS

1. Sherwood Brass Works use three 1-ton electric furnaces lined with refractory made by Jonathan Bartley Crucible Company.
2. Lawtonite linings last three times as long as previous linings.
3. One of the furnaces has given 2,100 heats and lining will be good for 3,000 heats.
4. Frequent changes in temperature do not harm Lawtonite refractory material.
5. Withstands wear and rough treatment of charging.
6. Refractory cost per heat is 18 cents as compared with 30 cents for former lining.
7. Saves $396.00 in refractory cost per year.
8. Decreases lost furnace time by 11 furnace days annually.

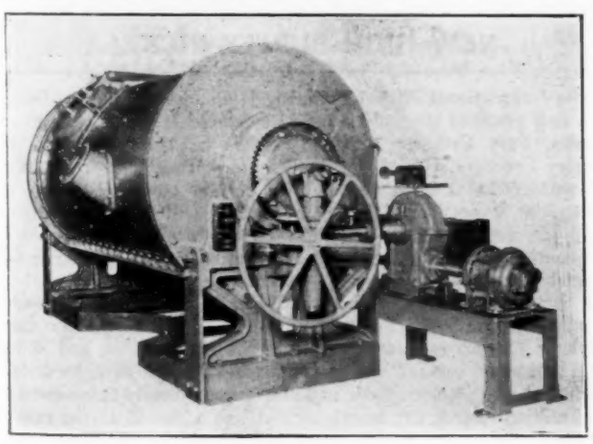
MICHIGAN LUBRICATOR COMPANY

1. Refractory made by Jonathan Bartley Crucible Company used in 2,000-pound electric furnace.
2. Lasts over four times as long as previous refractories.
3. Present lining has given 2,200 heats.
4. Temperature as high as 3,500° F.
5. Severe temperature strains developed.
6. Present lining is in three layers with Lawtonite refractory on inside.
7. Expansion and contraction cause no injury to Lawtonite lining.
8. Refractory cost cut from 68 cents per heat to 30 cents per heat; a reduction of 63%.
10. Lawtonite lining saves $456.00 per year.
11. Fewer replacements result in saving 7.2 days of productive time per year.

NEW TILTING FURNACE

The Monarch Engineering and Manufacturing Company of Baltimore, Md., is building a new line of Simplex tilting furnaces without crucibles, for melting all types of metals. This furnace includes their patented oscillating device, reducing labor by making the furnace operation practically automatic.

The furnace is built in sizes up to 12-ton capacities per heat. It uses oil or gas for fuel, and is especially adaptable for brass



NEW SIMPLEX FURNACE

rolling mills or for the melting of copper or other metals, for tubing or running down scrap metal into pigs.

The illustration shows the principles of operation such as oscillation, through the regulation of which the metal can be poured. The furnace is said to be extremely simple to operate.

NEW METAL MELTING POT

A new metal melting pot, with a capacity of approximately 1,000 pounds, has been added to the General Electric line and is now on the market. This pot, utilizing the electric heating principle, is practically the same as other standard General Electric melting pots except that three cast-in, sheath wire immersion heating units are used instead of two.

The pot itself consists of a sheet steel, cylindrical casing in which is supported a cast-iron crucible of the following dimensions: inside, 18 inches in diameter and 15 inches in depth; outside, 29 inches in diameter and 31 inches in depth. The space between the casing and the crucible, measuring about three inches, is efficiently insulated with a compact heat insulator The leads of the heating units are brought over the top of the pot into a connection box fixed to the unit itself.

1000 LB. ELECTRIC METAL MELTING POT

Melting pots of this type are designed for melting lead, babbitt, tin, solder and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 850 degrees.

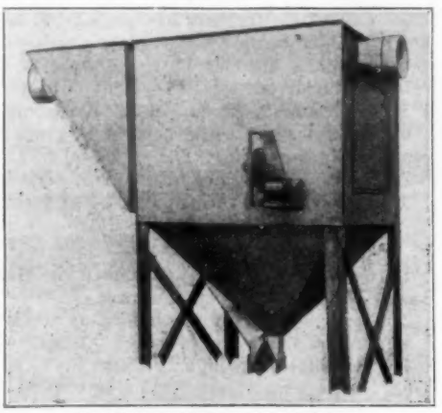
Full-automatic control is recommended, consisting of a standard automatic control panel and a temperature control instrument equipped with a special bulb for metal immersion.

Separate heating units may be installed in existing installations of melting pots where dimensions permit and where temperatures do not exceed 850 degrees F.

DUST ARRESTER

The Ruemelin Manufacturing Company of Minneapolis, Minn., manufactures a vacuum type dust arrester in which the bags are mounted in a dust-tight sheet metal enclosure. The exhaust fan handles only the clean air after it has passed through the bags which collect the dust.

Removal of the accumulated dust in bags is accomplished by a motor-driven bag-shaking device which needs to be operated, it is claimed, for only ½ minute, once or twice a day. The dust from the bags falls into a hopper from which it can be easily removed. Doors provide access to the bags for inspection and repairs.



VACUUM TYPE ARRESTER

This company also manufactures pressure type arresters intended especially for small foundries. This is an inexpensive installation.

HOOD SAND BLAST MACHINE

This is a sanitary blast machine using a Midget sand blast gun and requiring only one man to operate it. The parts to be cleaned are conveyed to the operator's position, continuously or intermittently by a revolving table. The hood is easily and quickly raised and swung to one side thereby exposing the entire table surface for loading or unloading by crane or hand.

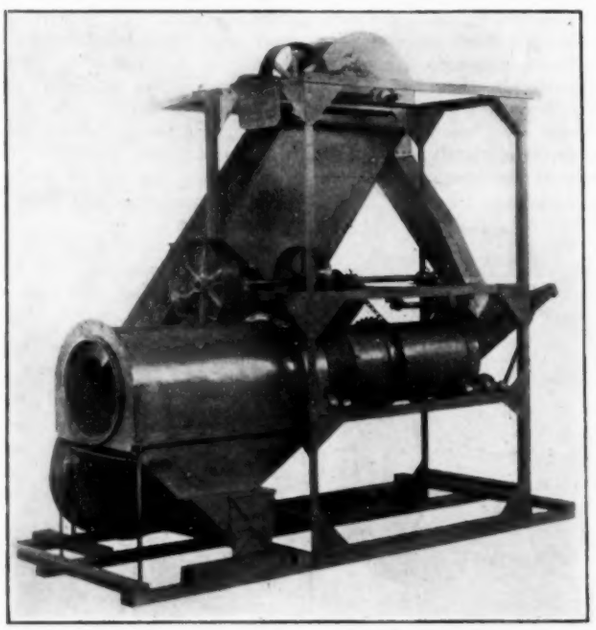
HOOD TYPE SAND BLAST MACHINE

NEW METAL DRYING MACHINE

The Ideal Concrete Machinery Company, Cincinnati, Ohio, has brought out a new machine for the drying of stampings and similar work in sawdust without the labor of separating the sawdust from the work and re-drying it through a separate operation.

The machine is essentially a cylinder with a worm fastened to the inside. This worm is welded to prevent small pieces sticking underneath the worm. The first part of the cylinder is made of solid sheet metal, and the second part is made of screen. The machine also contains a heated conveyor extending from the screen to a discharge chute which empties into the cylinder at the charging end. In operation a constant stream of sawdust is passing through the machine, being fed in at the charging end and screened out through the cylinder in the screen section, and then being heated and conveyed up to pass through the machine again. The work is fed in at the charging end of the machine and passes through the solid cylinder and the screened cylinder, coming out at the discharge end of the machine, the moisture on the pieces having been taken up by the hot sawdust which it passes going through the machine.

These machines are built in various sizes, and where desired the sawdust drying equipment is attached to an Ideal power loading and unloading tumbling barrel so that the work can be held in the machine and tumbled with the sawdust as long as required.



METAL DRYING MACHINE

NEW HIGH PURITY NICKEL

The International Nickel Company is announcing the production of a new grade of electrolytic nickel produced at the Port Colborne Works, Port Colborne, Ontario. It is being produced by the Stanley Process developed by R. C. Stanley, President of the International Nickel Company, but with certain modifications in the electrolytic operation. This new product will have a purity of 99.90 per cent and will be the highest grade of nickel ever produced in quantity on a commercial basis by any company, in that it will be carbon and sulphur-free.

It is produced in the standard 27" x 36" cathode, weighing approximately one hundred and fifty pounds, or will be cut into varying sizes of squares down to 1" as the trade requires, and in this form will be known as "Electro Squares." Present capacity for the production of this electrolytic nickel is approximately three-quarters of a million pounds per month and will be added to as the market requires.

The high purity of electrolytic nickel and its freedom from carbon and sulphur are said to make it particularly applicable to the special requirements of the producers of high nickel content alloys such as nickel-silver, copper-nickel, nickel chromium and ferro-nickel. Its development will not interfere in any way with the current and future production of the standard 99 per cent nickel which for years has been used in shot and ingot form.

ELECTRO-PLATING GENERATORS

The Ideal Electric and Manufacturing Company, Mansfield, Ohio, builds a standard line of electro-plating generators for electro-plating, electro-cleaning, galvanizing, extraction or refining of metals, electrotyping.

Ideal generators are manufactured in standard sizes for belt drive and for motor-generator sets. Motor-generator sets are furnished with synchronous, induction or direct current motors.

Standard sizes ranging from 50 to 300 amperes have single commutator, two wire, six volts only. From 500 to 10,000 ampere machines have two commutator 6 or 12 volts and may be connected for either two or three wire service.

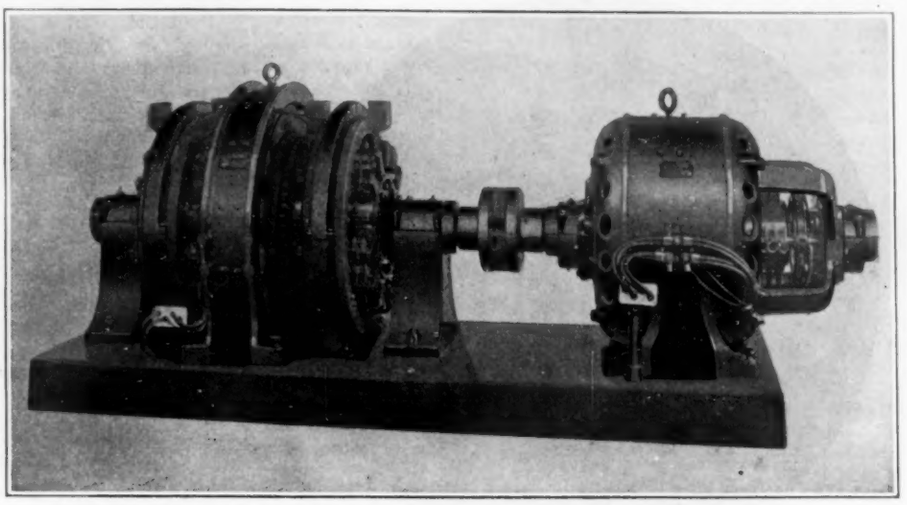
The brushes are said to give practically sparkless commutation at full or no load. They do not scratch or plate, but polish and glaze the surface of the commutator. Hard drawn copper, insulated with the finest grade of mica are used for commutators. The core is laminated and of high grade specially heat treated electrical iron.

Formed coils of rectangular copper wire, are used for winding, insulated by hand taping and thoroughly impregnated with insulating varnish and thoroughly baked. Two separate windings are used in two commutator armatures. The open construction allows ample circulation of air.

The main poles are of specially heat treated laminated construction in smaller sizes. Cast steel of high permeability is used in larger sizes. The shunt field is wound of double cotton covered magnet wire impregated with insulating varnish and thoroughly baked. The series field is strip copper, insulated with empire cloth and linen tape. The coils are impregnated with insulating varnish and thoroughly baked.

The bearings are of the bracket type, heavy duty, phosphor bronze with oil grooves. In the pedestal type, split, babbitt is scraped in to fit the armature shaft in exactly the same manner an automobile crank shaft is fit. One or two oil rings are used on bronze bearings and two oil chains on larger sized installations of equipment.

All standard Ideal apparatus is guaranteed to meet the Electric Power Club's Specifications for standard open type machines. They are rated on a 40 degree temperature rise, unless otherwise specified.



9000 AMPERE 6-12 VOLT GENERATOR, 75 H.P. 230 VOLT DIRECT CURRENT MOTOR, 385 R.P.M. TYPE HP—2000 TO 10,000 AMPERE, BUILT FOR FORD MOTOR COMPANY

HARD RUBBER TANKS AS USED IN THE PLATING INDUSTRY

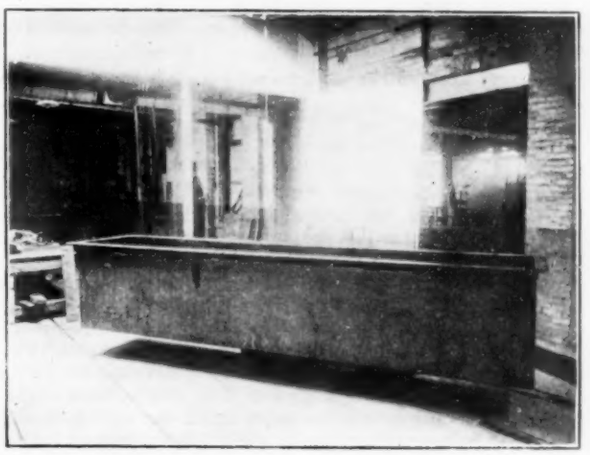
The use of hard rubber in the plating industry is not confined to the covering of plating racks, hard rubber utensils, tumbling barrel sides or insulation as indicated by the accompanying photograph of a hard rubber lined plating tank furnished to a large manufacturer of automobile parts by a leading manufacturer of plating equipment. The lining was made by the American Hard Rubber Company, New York. This tank is 14′ 11″ long x 2′ 8″ wide x 3′ deep and is one of a unit for automatic plating work. It is constructed of ¼″ steel plate with a ⅜″ hard rubber lining extending over the flange and sides for approximately 3″.

There are decided advantages claimed for hard rubber tanks for plating work. The danger of short circuits is eliminated by the insulating properties of hard rubber. Current leakage is minimized. The corrosive action of plating solutions which ordinarily attack wood, lead, etc., is eliminated.

The following are some of the more common plating solutions with which hard rubber tanks are recommended for use with safety and the approximate temperatures at which the solutions are kept:

Pickle for brass at room temperature.
Bright dip for brass at room temperature.
Pickle for steel at 120° to 150° F.
(dilute sulphuric or dilute hydrochloric).
Pickle for steel up to 180° F.
(nitre cake or sodium acid sulphate).
Gold cyanide solutions, to 180° F.
Silver cyanide solutions, to 180° F.
Chromium solutions, 120° to 180° F.
Cleaners of the caustic type, such as potash, soda, cyanide, borate, trisodium phosphates, etc.
Cadmium, 150° F.
Cyanide zinc solutions, 125° F.
Acid zinc solutions at room temperature.
Cyanide copper solutions at 125° F.
Acid copper solution at 100° F.
Nickel solutions, single and double salts at 140° F.
Tin solutions, up to 180° F.
Lead solutions containing hydrofluoric acid, up to 140° F.

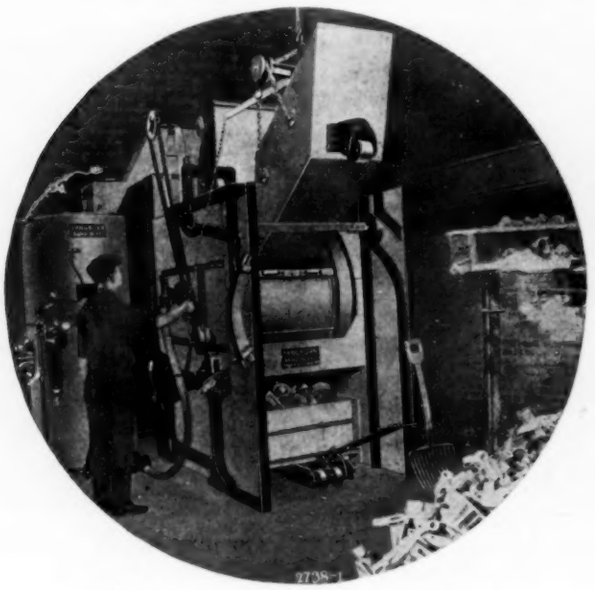
The economical feature in using hard rubber covered plating tanks is their long life and the fact that they do not require the construction of costly mould equipment; merely the use of existing steel tanks or new ones at comparatively low cost.



HARD RUBBER LINED PLATING TANK

SAND BLAST EQUIPMENT

The Pangborn Corporation of Hagerstown, Md., is manufauturing a new "Loads-Quick" sand blast barrel which, it is claimed, cuts loading and unloading time by more than half. An exhibit at the recent convention of the American Foundrymen's Association



"LOADS-QUICK" SAND BLAST BARREL

in Detroit showed this barrel with an overhead trolley and demonstrated the practicability of routing castings from the molding floor, loading, cleaning, unloading and delivering to grinders with only an initial manual handling. This mechanical sequence of operations, it is stated, cuts the time and labor to a point at which the barrel output is double that of the old methods.

DUST ARRESTER

A new cloth-screen dust arrester was also shown. This is shipped fully assembled and requires no erection in the field. It is made to handle air volumes up to 2,800 cubic feet per minute. This arrester is made in small and large sizes to meet the demand for ventilation and dust suppression in small machine units or in individual operation as well as in small plants.

BLOWER SYSTEM

A report of a blower system installed by the Kirk & Blum Manufacturing Company for the Warner Corporation, Division of Durant Motors Corporation in Muncie, Ind., has been made by H. B. Gould, Chicago, Ill. W. W. Smith, resident engineer of the Warner Corporation, wrote the report. The outstanding features reported are as follows:

1. Warner Corporation has installed 4 Kirk & Blum blower systems in five years.
2. In the polishing and buffing department, the blower system (10 HP.) is said to get at least 95% of all the dust and lint from the wheels.
3. A 30 HP. installation removes cyanide fumes from heat-treating furnaces and has resulted in stopping noticeable corrosion of metal roofing, etc., in this department.
4. It is believed that the design of these blower systems has resulted in a saving of 20% HP. over what the average system would require. The four systems have a combined HP. of 75 and cost $3,560 a year to operate. This figure covers depreciation ($300), interest ($160), maintenance and repair allowance ($100), power cost ($3,000). The estimated saving therefore in HP. figured at $40 per HP. year amounts to $750. In addition, there is a saving of one man's time, or about $1,000 per year in cleaning, labor. It is estimated that all the above blower systems will pay for themselves in three years.

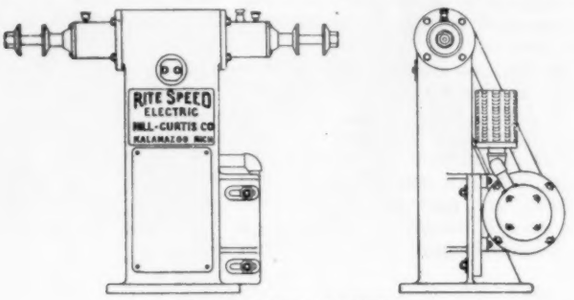
So far these systems have never required any repairs.

NEW MOTOR-DRIVEN LATHE

The Hill-Curtis Company of Kalamazoo, Mich., has put out a new motor-driven lathe which they call the Rite Speed Lathe. The lathe can be operated at various speeds, adjustable to the needs of the user, for polishing and buffing. The changes of speed can be made simply and quickly. The motor is entirely enclosed and can be of any standard make.

All of the air used in pulling the motor is drawn through a patented air filter, thus keeping the motor clean and free from dust and other foreign matter. It is stated that it is not necessary to pipe to the outside for air.

The drive is a special patented multi-V belt instead of a flat belt. The belts run slack and no tightener is needed, thus avoiding the straining of the spindle and the wearing out of bearings.



"RITE SPEED" LATHE

The spindle can be had with two, three or four Timken roller bearings or ball bearings.

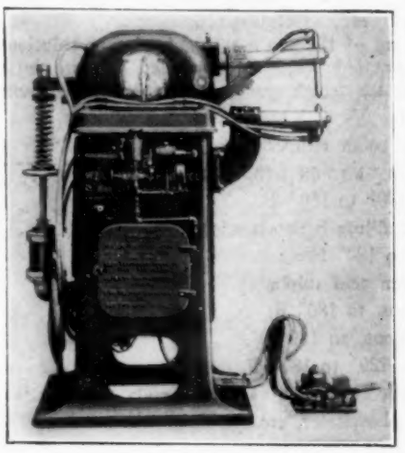
Patents have been taken covering the special arrangement for motor ventilation and cooling, and also for the special V-belt drive, among other improvements.

AIR OPERATED SPOT WELDER

Attempts to increase speed on a hand or foot operated spot welder have frequently resulted in poor welds, owing to the personal equation varying the length of time in the making of a weld. Although heat and pressure remained constant the time element changed more or less with each weld. In addition, speed on a manually operated spot welder where there is large production has always been accomplished by fatigue.

The air operated spot welder, it is claimed, insures uniformity in heat, pressure and time and as a result, uniformity in welds. The operation by air is almost instantaneous. The slightest pressure at the air valve operates the machine. Girls can operate the high speed air operated spot welder without the slightest fatigue. It is stated that production has been increased 30 to 90 per cent.

One concern placed an order for six of these machines, made by the Gibb Welding Machines Company of Bay City, Mich., basing their requirements on their experience with production of manually operated machines. They found that four machines took care of their entire production.

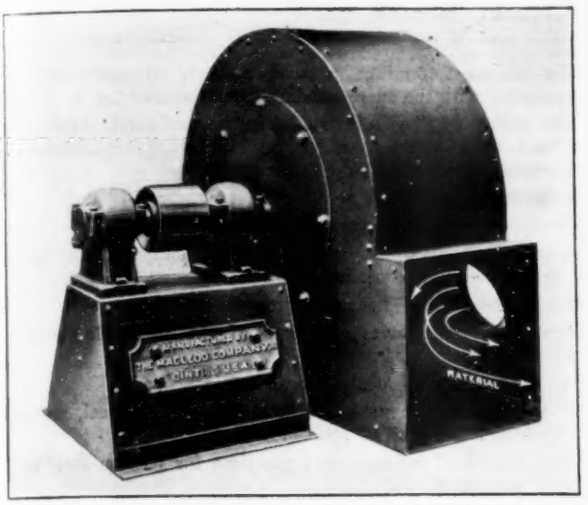


AIR OPERATED SPOT WELDER

The chief value claimed for the high speed air operated spot welder as made by this company is on sheet metal of 18 gauge and heavier, as on this work not only is fatigue eliminated but increased speed is possible. On the lighter gauges, while the air operation eliminates fatigue, there is no advantage in speed. The machine can be used on sheet brass, zinc, nickel, nickel silver, monel and aluminum as well as steel.

EXHAUST FAN

The Macleod Company, Cincinnati, Ohio, is placing on the market a new exhaust fan, different from the ordinary type. The material does not come in contact with the impeller as in many other designs, thereby, it is claimed, giving longer life to the fan which does not become clogged or worked out of balance.



MACLEOD EXHAUST FAN

The material is brought through a projected inlet and discharged at right angles, the wheel being protected by a deflector plate. The only duty imposed on the impeller is a creation of suction by centrifugal force, the air passing the inlet causing a high suction. The manufacturers claim that this fan will convey material just as far and produce just as strong a suction as other fans, at the same time using less power.

Pressures up to 12" (6.92 ozs.) are said to be obtainable and the fans are built to handle a wide range of material.

HEAT TREATED NICKEL ANODES

The Hanson and Van Winkle Company of Newark, N. J., is offering a line of rolled elliptical heat-treated 99 + per cent nickel anodes. These anodes are said to have a uniform crystalline structure resulting in uniform corrosion and constant metal content of solution. Advantages claimed are:

1. They produce no sludge.
2. They greatly reduce the amount of salts required to be added to the solution.
3. They corrode evenly rather than disintegrating in metallic particles.
4. They permit a uniform distribution of the current over the entire anode.
5. They greatly simplify the problem of proper chemical control of solution.

Equipment and Supply Catalogues

Grinding Machinery. Hardinge Company, York, Pa.

Babbitt Metal Data. Hoyt Metal Company, St. Louis, Mo.

Colliau Cupola Blocks. Frederic B. Stevens, Detroit, Mich.

Tension Motor Base. Tension Motor Base Company, New York.

Steel Plate Blowers. American Blower Company, Detroit, Mich.

"Sirocco" Fans and Blowers. American Blower Company, Detroit.

"Finish Sells Goods." Meaker Galvanizing Company, Chicago, Ill.

The Oxwelder's Manual. Oxweld Acetylene Company, Long Island City.

Crown Plating Machine. National Steel Products Company, Dayton, Ohio.

Drop Forged Tools. Billings & Spencer Company, Hartford, Conn.

Light Alloys in the Automobile. British Aluminium Company, New York.

"The Diamond and Industry." Wheel Trueing Tool Company, Detroit, Mich.

Diamonds for Industrial Purposes. Selma Mercantile Corporation, New York.

Nickel Steel. Data and applications. International Nickel Company, New York.

Beaver Pebs. A metallic polishing material. H. Leroy Beaver, Philadelphia, Pa.

Electric Furnaces of the Revolving Retort Type. W. S. Rockwell Company, New York.

Airco Davis-Bournonville Acetylene Generators. Air Reduction Sales Company, New York.

Recommendations of Books on Electro-Plating. Hanson & Van Winkle Company, Newark, N. J.

"Finishing Facts." A booklet on lacquers. Lacquer & Chemical Corporation, Brooklyn, N. Y.

Steel Melting in Ajax-Northrup High Frequency Furnaces. Ajax Electrothermic Corporation, Trenton, N. J.

The Twelve Essentials of a Good Tensile and Compression Testing Machine. Herman A. Holz, New York.

"Protect Your Plant and Equipment." Corrosion prevention by Triple A solutions. Quigley Furnace Specialties Company, Inc., New York.

Aluminum Shingles. Price list and descriptive material on "Lighthouse" aluminum roofing. Aluminum Company of America, Pittsburgh, Pa.

Engineering Achievements of the Westinghouse Electric & Manufacturing Company for the year 1926. By H. W. Cope, assistant director of engineering, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

General Electric Publications. 1927 Diary, note book and data book; Mechanictal Drive Turbines, Type D; Dynamometers; Small Multi-stage Centrifugal Air Compressors; Automatic Welding Head and Control; MT Control System for Direct-Current Motors; Pedestal Bases for Vertical Motors; Constant Potential Arc Welding Sets; Hand Starting Compensators.

CHRISTMAS CARDS

We have been favored with Christmas greetings from a number of our friends, among whom are the following:

Chase Companies, Waterbury, Conn.

Balbach Metals Corporation, New York.

American Boron Products Company, Inc., Buffalo, N. Y.

Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Dr. Robert J. Anderson, consulting metallurgical engineer, Cincinnati, Ohio.

CALENDARS

A number of attractive and useful calendars have reached us from the following firms:

C. R. Gibson & Company, New York.

New York Central Railroad, New York.

West Virginia Pulp & Paper Company, New York.

E. F. Houghton & Company, leather and oils, Philadelphia.

Charles F. Kenworthy, Inc., industrial furnaces, Waterbury, Conn.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

THE AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN STREET, CHICAGO, ILL.

The American Foundrymen's Association completed its thirtieth year of existence in 1926. The outstanding feature of the year was the holding of the Second International Foundrymen's Congress at Detroit the week of September 27 which was attended by 5,600 American and 150 other foundrymen from 12 different countries. In connection with the Detroit Convention there was held an exhibit of foundry equipment and supplies occupying over 80,000 square feet of floor space. The registered attendance and the size of the exhibits exceeded those for any previous meeting.

At this meeting there were held 22 technical sessions at which were presented 54 papers and 16 committee reports covering shop practice and research developments in the four branches of the industry, namely, steel, malleable, non-ferrous metals and gray cast iron.

Membership during the year increased from 1754 to 2162 an increase of 24 per cent. This increase in membership was partially accounted for by recently adopted policy of permitting members of firms holding membership to take out active membership for a nominal sum of $7.50 as yearly dues. The purpose of this policy was to provide for greater distribution of the association's technical literature, among the laboratory and shop executives where it could be of greatest use.

Publications issued during the year consisted of a 1000 page volume of transactions, a quarterly bulletin and 44 technical papers. The principal technical committee activities were as follows:—

Research on Foundry Sand Problems.
Survey of Foundry Refractories.
Cost System Education.
Pattern Standardization.
Apprentice Training.
Corrosion of Metals.

The Metals Committee pursued a study of specifications by co-operating with the corresponding committees of the A. S. T. M.

The policy of the Association in its technical investigations has been to co-operate with other interested organizations in joint researches to avoid duplication of effort.

Noteworthy committee activities were:—

Development of core sand testing methods.

Development of sand grading classifications for clay content and grain fineness properties.

Completion of molding sand resources survey.

Survey of refractories problems of the malleable, steel and non-ferrous casting industries.

Apprentice molding contest, national in scope.

Development of recommended cost divisions for steel, malleable, cast iron and non-ferrous foundries.

Development of recommended practices for pattern making and vibrator standards.

1927 CONVENTION

A distinct departure from past policy has been the decision to hold the 1927 Convention at Chicago, June 7, 8 and 9 as a strictly technical meeting without the usual exhibit feature. This decision was occasioned by the desire to return to spring conventions and an exhibit following so closely upon the Detroit exhibit would not have permitted exhibitors time to develop new equipment.

The 1927 Convention is planned to be an occasion fostering acquaintanceship, plant visitation, group discussion, management, shop and metallurgical problems and to be an enjoyable social occasion.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

HEADQUARTERS, CITY HALL SQUARE BUILDING CHICAGO, ILL.

The National Association of Brass Manufacturers held its Twenty-Fifth Anniversary at the Hotel Astor, New York City, on December 17, 1926, the evening previous to the Annual Banquet and Theatre Party, which was given to about sixty (60) of its members and invited guests.

At the closing session, the new official catalog was distributed to the members, as a result of the painstaking work of the Catalog Committee in the past two years and in which new and lower lists by "piece" instead of by the "dozen" will appear, and before undertaking their task, a survey and referendum was taken up from the wholesalers throughout the United States which showed they overwhelmingly favored these changes.

The change does away with the high and fictitious discounts formerly used, which gives the public and user a more intelligent idea of what the cost of the articles will really be. Also lends itself as a quick and ready reference for jobbers, plumbers and contractors.

Standardizations adopted by the Association in the past several years are illustrated in the book. In addition, a treatise of the proper method of installation, as well as the right method of caring for goods after goods are installed form an important feature in the book.

Many goods heretofore listed in finished and nickel plated, now takes the same list, which will avoid duplication of stocks or inventories upon the part of the wholesaler or plumber. Many new rules and regulations tending to be helpful to the industry are incorporated and take the part of what is ordinarily used as a "preface."

This catalog supersedes all previous issues and should be in the hands of every manufacturer, wholesaler, plumber and contractor, and the Master Plumber should write to his source of supplies for copies of this catalog.

The following officers were elected:

President	H. C. Bulkeley	Abingdon, Ill.
Vice-President	C. J. Muend	Philadelphia, Pa.
Trustees	Nelson Lawnin	St. Louis, Mo.
	E. A. Roberts	Detroit, Mich.
	R. L. Ottke	Pittsburgh, Pa.

The following were appointed:

Director Nelson Lawnin to the National Trade Extension Bureau.

Councillor Karl Legner to the United States Chamber of Commerce.

Delegate A. C. Brown to the Central Supply Association.

Commissioner William M. Webster re-submitted his resignation that was originally placed at the West Baden meeting last March, owing to the fact that it was his desire to retire, after guiding the work and destinies of the Association for the last twenty-five (25) years, and it was decided to accept same. He promised, however, to remain with the Association until the next meeting in April.

The Association discussed the question of enlarging its activities and, if need be, to consolidate with other organizations in the Plumbing Trades Industry, all of which is in keeping with the policy that has been advocated by Secretary Hoover of the Department of Commerce.

The Board of Trustees of the Association were given authority to look into the question of amalgamation or consolidation with other associations that are now in existence in the Plumbing Industry, with a view of curtailing a lot of duplication in the Association's activities.

This matter will be further discussed at the Spring meeting of the Association that will be held in Cleveland on April 14 and 15.

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39TH STREET, NEW YORK

The Institute of Metals Division, A. I. M. E., lost one of its most efficient men in the person of George K. Elliott who was, past chairman of the Division for two years. Mr. Elliott's advice and help in the Division work was considerable, and the Division has sustained a great loss in his death.

The Division held two regular meetings during 1926, one in Detroit in conjunction with the American Foundrymen's Association in September, and the other last February in New York City. Both of these meetings were well attended and the discussions were animated and full.

As for 1927 Chairman Paul D. Merica has adopted a new plan of organization which will call for several new committees. Among these will be a Committee on the Annual Lecture headed by Dr. Zay Jefferies; also committees to cooperate with the various local chapters of the A. I. M. E. in an effort to interest more people in the work of the Division.

One of the most important moves for 1927 will be the definite responsibility of the Division for a certain amount of space in Mining and Metallurgy, the official organ of the A. I. M. E. This space will be under the direction of Dr. E. C. Bain of the Union Carbide and Carbon Research Laboratories, Long Island City. This means, of course, that the Division members will have a particular place for their news and items of special interest to them.

During 1926 arrangements were made with the American Society for Steel Treating to co-operate with them on the preparation of data sheets on non-ferrous alloys. A committee is now being formed in the Division to undertake the work of preparation of material for these data sheets and to supervise the editorial work in connection with them. These sheets will be issued by the American Society for Steel Treating and will be distributed to their members and to the members of the Division. This marks a very definite step forward in cooperation with that Society.

The program for the year under the able chairmanship of S. Skowronski has been unusually good, and the papers promised for 1927 will be better, if anything, than those for 1926.

The Winter meeting will be held in New York at 29 W. 39th Street, February 14-18, 1927.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 VICTORIA STREET, WESTMINSTER, LONDON, S. W. 1, ENGLAND

The past year has been a very successful one for the Institute of Metals. The membership has increased from 1692 to 1800, representing the largest growth for many years. As this has taken place at a time of grave general industrial depression in this country it signifies a welcome amount of vitality in the metal industries to which the Institute specially caters.

During the year there has been a large growth in interest in the work of the Institute abroad, particularly in the United States and Germany. Since a year ago the German membership —which, of course, had disappeared during the War—has grown from half a dozen to 60; during the same period the membership in the United States (which is the largest of any country outside Great Britain) increased from 240 to 265.

The usual three meetings of the Institute were held during 1926: the first of these took place in London in March, when 16 papers were read; in May the Annual May Lecture—a discourse that is always given by a scientist of international repute—was delivered by Professor H. C. H. Carpenter, on "Single Metallic Crystals and their Properties": the final meeting of the year was the fall gathering which was held in Liége, Belgium. This Meeting, taking place in a convenient international centre, was attended by some hundreds of metallurgists from all over the world, and was very successful both technically and socially.

The publications of the Institute of Metals were more numerout last year than previously, and included in addition to preprints of over 30 Papers, two large bound volumes of the Institute's "Journal" totalling over 1,800 pages.

In addition to the foregoing activities, the Institute has had at work a large number of Committees dealing with many branches of metallurgical activities, one of these being the Corrosion Research Committee which has prepared during the year material for a further Report, the last of which, of course, was the well-known Seventh Report to the Corrosion Research Committee. The Committee's laboratories at the Royal School of Mines have been visited—as have the offices of the Institute—by many American and European metallurgists and engineers.

In 1927 the work of the Corrosion Research Committee is to be continued with increasing vigour, as are the general activities of the Institute, which will be on similar lines to those so successfully pursued in 1926. The Spring meeting, for which 17 Papers are already in hand, will be held in London in March, to be followed in May by the Annual May Lecture, to be given by Sir Henry A. Miers, on "The Growth of Crystals in Supersaturated Liquids." The 1927 Fall meeting will be held in Derby.

AMERICAN ELECTRO-PLATERS' SOCIETY

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

The American Electro-Platers' Society at the close of 1926 can look back with pride at the work accomplished during the year, and also look forward to the work planned for 1927, with 22 Branches in as many cities in the United States and Canada, each one striving to do its best for the improvement and dissemination of knowledge concerning the Art of Electro-deposition.

Each year the ranks of the Old Timer, with his rule of thumb and guesses, is passing away and the plater of today with his chemical knowledge and chemical control of his solutions takes his place. The steady increase in members of this Society, shows that the Old Timer, when given the opportunity to learn the chemical analysis of his solutions, is always willing to learn and be the plater of today. All platers realize the fact that the demand today is for foremen, who can chemically and electrically control their solutions and finishes.

A number of the Branch Societies either have their own laboratories or have classes in some high school or college, where they instruct their members in the chemical analysis of plating solutions. One Branch has gone a step further in this educational work, by educating the future foreman plater, having started an elementary class for assistant platers, at the Kensington Evening High School in Philadelphia. This class was started after thoroughly going over the question which arises at each convention, as to admitting the assistant plater to the Society. As the Society was founded and chartered for the purpose of getting together the foreman platers, the majority of them still believe it ought to stay as such to accomplish the best results. But as that does not eliminate the assistant in our daily routine and as we cannot progress without good assistants in our regular days work, they have opened two classes,—an elementary class, which meets on Monday and Wednesday nights, for the assistant plater and any new member of the Branch who has not had a course in chemical analysis of plating solutions, and an advanced class which meets on Tuesday nights for the foreman platers who have qualified and passed the elementary class; this class to do experimental and research work.

The publication of The Monthly Review has been given a higher and broader scope by resolution passed last July in Newark, to release papers immediately after the meetings. Five Associate Editors have been added to the staff, so that papers read could be released more quickly and given proper publication in other trade papers.

The Research Committee conference in Washington during October decided that as they had on hand about $3,500.00 and pledges of nearly an equal amount for two additional years, they would start a man in January, 1927, on the study of Spotting Out, at the Bureau of Standards in Washington, D. C., under the direction of Dr. Wm. Blum.

The Annual Convention of the Society held in Newark, N. J., June 28th to July 1st 1926, was the largest and best in attendance, exhibits and educational papers that was ever held by the Society.

It is well to mention here that the yearly meetings and conventions are highly honored by such men as W. E. Hughes, of England, Dr. S. E. Sheppard, Dr. E. K. Strachan, of Brown University, Dr. Wm. Blum of the Bureau of Standards, Washington, D. C., and many others, and that it is well to start now making arrangements to attend the next convention in Toledo, Ohio, next June.

Newark Branch is to be complimented for holding one of the largest and best conventions ever held by the Society.

The next Convention will be held in Toledo, Ohio, during the week of June 27, 1927, and Toledo has elected a hustling committee, also promising another banner year for the A. E. S. convention. All communications relating to the Convention should be sent to Convention Secretary, Lester D. Cope, Route 8, Box 664, Toledo, Ohio.

CHICAGO BRANCH

HEADQUARTERS, CARE OF ROBERT MEYERS, 2432 WILSON AVE.

The fifteenth educational meeting and dinner dance will be given by the Chicago Branch of the American Electro-Platers' Society, Saturday afternoon and evening, January 29, 1927, in the Red Lacquer Room of the New Palmer House, Monroe street and Wabash avenue, Chicago, Ill.

The Educational Session will be held at 2 P. M. sharp in the foyer of the Grand Ball Room on the fourth floor; assembly and reception for the evening, 6 to 7 P. M.; banquet at 7 o'clock sharp.

A very interesting program has been arranged for the Educational Session and the following are some of the features:

Throwing Power of Plating Solutions. Dr. Oliver P. Watts, University of Wisconsin.

The Effect of pH Concentration on Nickel Deposits. Cleveland Nixon, Western Clock Company, La Salle, Ill.

Corrosion of Silver Deposits. H. A. Gilbertson, Gilbertson & Son, Chicago, Ill.

Notes on Chromium Plating. F. R. Porter, Edison Electric Appliance Company, Chicago, Ill.

Ladies are especially invited. A fine entertainment has been provided with an excellent orchestra, so a good time is assured.

Tickets will be $3.50 per person. Send remittances to Robert Meyers, secretary, 2432 Wilson avenue, Chicago, Ill.

NEW YORK BRANCH

HEADQUARTERS, CARE OF J. E. STERLING, 2595 45TH STREET, ASTORIA, L. I.

The invitation meeting of the New York Branch, A. E. S. held on December 9, 1926, proved a great success. Nearly 100 members and guests were present, to hear the speakers who were C. L. Mantell of Pratt Institute who spoke on this history of Tin and Oliver Sizelove who spoke on Chemical Analysis Control of Plating Solutions. Dr. Blum of the Bureau of Standards also gave the platers present at the meeting something to think about as did George B. Hogaboom. After the meeting the committee served refreshments which were enjoyed by all.

The committee for the 18th annual banquet of the branch which also is to be known as Founders' Day in honor of the founder of our Society, Charles H. Proctor, is working hard to make the afternoon session, which will be open to all interested, and will be held at 3 P. M., preceding the banquet, an instructive and interesting one. All communications and reservations for the banquet should be addressed to the branch secretary, John E. Sterling, 2595 45th Street, Astoria, L. I. The committee for the banquet is headed by R. J. Liguori. Tickets are $4.00 per person at the usual place, the Aldine Club, 200 Fifth Avenue, N. Y.

The New York Branch of the American Electro-Platers' Society sends out a cordial invitation to all of its friends to attend the Eighteenth Annual Founder's Day and Banquet to be held at the Aldine Club, 200 Fifth Avenue, corner 23rd Street, New York City, on Saturday, February 19, 1927.

Afternoon session will start at 3 P. M. Papers and addresses will be delivered by prominent chemists and platers; banquet at 7 P. M., with dancing afterward. Bring the ladies and have a pleasant afternoon and evening. The chairman of the Banquet Committee is R. J. Liguori. Tickets can be obtained, at $4 per person from John E. Sterling at the above address.

NEWARK BRANCH

HEADQUARTERS, CARE ROYAL F. CLARK, 55 SEYMOUR AVENUE

The Newark Branch of the American Electro-Platers' Society will hold an open meeting Friday, January 21, 1927 at Franklin Hall, 41 Franklin Street, Newark.

All the members and their friends from other branches are invited. A program of excellent papers has been arranged and several men of prominence in the plating industry will address the meeting.

ST. LOUIS BRANCH

HEADQUARTERS, CARE OF F. J. MUSICK, 7144 KINGSBURY BLVD. ST. LOUIS

The St. Louis Branch of the American Electro-Platers' Society will hold its fifteenth annual banquet at the American Annex, Sixth and Market streets, St. Louis, Mo., on Saturday afternoon and evening, January 22, 1927. The Educational Session will begin at 3:30 P. M. At the same time a moving picture party will be held for the ladies. Dinner is scheduled for 6:30 P. M. and will be followed by entertainment and dancing. For reservations and further information communicate with E. J. Musick at the above address.

INTERNATIONAL FELLOWSHIP CLUB

HEADQUARTERS, CARE OF R. J. HAZUCHA, 1115 WASHINGTON BOULEVARD, CHICAGO, ILL.

Announcement is made of a change in the headquarters of the International Fellowship Club from New Haven, Conn., to Chicago, Ill., at the address noted above.

As announced in THE METAL INDUSTRY for December, the next meeting will be held on January 29, 1927, at a luncheon at the New Palmer House, Chicago, Ill.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

The American Electrochemical Society held two national meetings during 1926, the first one at Chicago in April, and the second one in Washington in October.

At the Chicago Meeting the Symposium on "Chlorine" attracted world-wide attention. F. F. Colcord, of the U. S. S. Lead Refinery, East Chicago, presented the results of his investigation on the electrolytic parting of silver and gold. Prof. Per K. Frölich, and his associates G. L. Clark and A. H. Aborn, showed some very remarkable photographs, taken with the X-ray tube, of electrodeposits of lead obtained under varying conditions. Dr. H. E. Haring, of the Bureau of Standards, outlined a simple method for the measurement of polarization in plating cells. Messrs. H. C. Parker and W. N. Greer discussed the hydrogen ion control of nickel plating baths and strongly advocated the use of the quinhydrone electrode for this purpose. The advantages of cadmium plating were pointed out by H. S. Rawdon, of the Bureau of Standards. A second paper on cadium plating as a protection for iron was presented by Clayton M. Hoff, of the Grasselli Chemical Company, at the October Meeting of the Society.

At this October Meeting, held in Washington, D. C., the Symposium dealt with materials for extreme conditions. Silicon carbide, magnesite, vitreous quartz, and thorium zirconate were recommended as the best for high temperatures. Of the many metals proposed for withstanding extreme conditions, chromium and its alloys were conceded to surpass all others. Valuable new data on zinc plating baths was presented by M. R. Thompson of the Bureau of Standards. A detailed account of experiments on addition agents was presented by G. Fuseya and K. Murata. Voltage studies in copper refining cells, undertaken by Colin G. Fink and C. A. Philippi, emphasized the importance of closely observing anode and cathode polarization.

G. P. Fuller outlined the remarkable properties of electrolytic iron and L. McCulloch discussed the passivity and corrosion of iron. Prof. E. A. Vuilleumier reported on conditions necessary to obtain fine-grained deposits in electroplating. J. D.

Edwards and C. S. Taylor, of the Aluminum Company of America, made a study of the electrical resistivity of aluminum-calcium alloys, containing a large percentage of aluminum.

For the year 1927, two meetings are planned, the first one to be held at Philadelphia, April 27, 28, 29 and 30. This will be the silver jubilee meeting of the Society, since it was founded in Philadelphia on April 3, 1902.

For the Fall Meeting of 1927, a trip through the Northwest has been laid out. The new electrochemical plants that have sprung up throughout the West, in Montana, Idaho, Utah, Washington and British Columbia will be visited. Papers for this Fall Meeting will cover the electrochemistry of copper, lead, silver, zinc and cadmium. L. K. Armstrong, of Spokane, is Chairman of the Committee on Arrangements for this trip.

Personals

DR. ZAY JEFFRIES

Dr. Zay Jeffries, metallurgical engineer of Cleveland, Ohio, has been awarded the James Douglas medal of the American Institute of Mining and Metallurgical Engineers, for the year 1926.

DR. ZAY JEFFRIES

Dr. Jeffries is the fifth recipient of the Douglas medal, which is given for distinguished achievement in non-ferrous metallurgy. Last year the medal was awarded to W. H. Basset of Waterbury, Conn.

Dr. Jeffries was born in Willow Lake, S. D., April 22, 1888. His parents were Johnston Jeffries and Florence (Sutton) Jeffries. He was educated in Pierre, S. D., graduating from the high school in 1906, and received the degree of B. S. in Mining Engineering in 1910, and Metallurgical Engineer in 1914, both from the South Dakota School of Mines. In 1918 he received the degree of Doctor of Science from Harvard University. In 1911 Dr. Jeffries married Frances Schrader in Rapid City, S. D. They have two daughters, Betty and Marion.

Dr. Jeffries' professional career has been, briefly, as follows: manager Ideal Mining Company, Custer, S. D., 1910-1911; instructor in metallurgy, Case School of Applied Science, Cleveland, Ohio, 1911-1916; assistant professor of metallurgy, Case School, 1916-1917. While at the Case School he carried on consulting and experimental work in metallography for the Electric Railway Improvement Company, Cleveland Steel Tool Company, W. S. Tyler Company, Lincoln Electric Company, the Aluminium Castings Company and General Electric Company (Cleveland wire division). At the present time Dr. Jeffries is the head of the Cleveland Section of the Research Bureau of the Aluminum Company of America, acting as Consulting Metallurgist for that company; Consultant on Research and Development for the National Lamp Works of the General Electric; and Consultant on Research and Metallurgy for the National Tube Company.

DINNER TO MR. AND MRS. HORACE SMITH

A testimonial dinner was given to Mr. and Mrs. Horace H. Smith, at the Elks' Club, in Newark, N. J., November 1926 in appreciation of the work by them for the Annual Convention of the American Electro-Platers' Society, held in Newark, N. J., June 28-July 1, 1926. Over 60 members and their wives were present at the dinner. They presented Mr. and Mrs. Smith each with a diamond stick pin. Mr. Smith also received a loving cup and a fishing pole from the Fishing Club. Mr. Smith and Mr. Sievering were also presented with the medals which they had won in the running race at Weequahic Park during the sports held as part of the convention.

Mr. Proctor acted as toastmaster in very able fashion and presented the gifts in person. The whole affair was a surprise to Mr. and Mrs. Smith who showed their appreciation of the kindliness and thoughtfulness of the members. The dinner was followed by dancing and special entertainment.

Mr. Smith thanked the members for their co-operation in helping him to make the convention the biggest and best ever held by the Society.

Alvin S. Rich, formerly of Wagner Electric Corporation, is now connected with the New York Branch of Industrial Electric Motor and Tool Company, 1 Howard street.

Gregory J. Comstock has been appointed director of research of the Firth-Sterling Steel Company, McKeesport, Pa. He was formerly metallurgist of the International Silver Company.

John A. Coe, president of the American Brass Company, has been elected a director of the Anaconda Copper Mining Company to fill the vacancy caused by the death of Charles F. Brooker.

James L. Wick, Jr., has become manager of the Falcon Bronze Company, Youngstown, Ohio, succeeding G. A. Doeright, manager for many years, now confined to his home by ill health.

Grant B. Shipley, president of the Century Wood Preserving Company, has been elected chairman of the board of directors and chairman of the executive committee of the American Nickel Corporation, Clearfield, Pa.

A. L. Haasis, manager of the crucible department of the Joseph Dixon Crucible Company, Jersey City, N. J., has sent out to the trade his customary Christmas and New Year's greetings in the usual attractive folder.

William M. Rule has been appointed general manager of the Michigan Copper & Brass Company, Detroit, Mich., to succeed the late A. B. Selig. Mr. Rule has been associated with this company for the past seven years as treasurer.

W. L. Foster, has joined the sales promotion organization of the American Brown Boveri Electric Corporation, 165 Broadway, New York. He was formerly sales engineer for the Bridgeport Brass Company, Bridgeport, Conn.

W. R. Webster, vice-president of the Bridgeport Brass Company, Bridgeport, Conn., recently discussed the copper and brass manufacturing industry, before a meeting of the Metropolitan Section of the American Electric Railway Association.

A. F. Hamm has recently joined the selling organization of the International Chemical Company and is located at Boston, Mass. Mr. Hamm is acting as an assistant under L. C. Smith who has been taking care of this territory in the past and whose headquarters are at present in New Haven, Conn.

D. J. Benoliel, sales manager of the International Chemical Company has just returned from Chicago, Ill., where he was attending a sales conference of the company's western salesmen. The conference took place at the Congress Hotel in Chicago on January 3, 4 and 5, and was attended by all the men who are taking care of the Michigan, Wisconsin, Illinois, Ohio and Indiana territories.

H. H. Engle has been made vice-president and sales manager of the Hardy Metal Corporation, Seattle, Wash., manufacturer of non-corrosive contact metals. He was formerly general sales manager for Robert Gordon, Inc., Chicago. For the next six months Mr. Engle will be located in Chicago. The company is considering the permanent establishment of its general sales office in that city.

B. E. Holton, who has been for many years engaged in the lacquer and lacquer enamel business, has been placed in charge of the new Pacific Coast branch of the Maas & Waldstein Company at 1212 Venice boulevard, Los Angeles, Calif. This company is a well-known manufacturer of lacquer and lacquer enamels for every purpose, bronzing liquids, aeroplane dope, thinners, etc. Mr. Holton will be assisted by a corps of efficient salesmen.

Jesse H. Neal, who for eleven years has served as executive secretary of the Associated Business Papers, has resigned, his resignation effective January 1, 1927. He and Mrs. Neal will leave for a six-months' Mediterranean trip in January. The

executive committee of the Associated Business Papers has created a new office for the association, that of managing director, and Frederick M. Feiker has been appointed to that office. After January 1, 1927, the headquarters of the Associated Business Papers will be located at 52 Vanderbilt avenue, New York.

James H. McGraw, president of the McGraw-Hill Publishing Company, New York, was tendered a dinner on his 66th birthday commemorating 41 years of service to engineering and industrial progress, at the Hotel Astor, New York, on December 17, 1926. The committee that sponsored the dinner included Thomas A. Edison, as honorary chairman; Secretary of Commerce, Herbert Hoover; General Guy E. Tripp, chairman Westinghouse Electric and Manufacturing Company; Gerard Swope, president General Electric Company, and Owen D. Young, chairman General Electric Company.

George Solz, Jr., has been engaged by the Bridgeport Brass Company, Bridgeport, Conn., to sell their line of tubular plumbing supplies, brass pipe and fittings in Northern New Jersey, and the Bridgeport-Keating Flush Valve in the entire state of New Jersey and Rockland County, New York. Mr. Solz, who was formerly connected with Warren Balderston, Trenton plumbing jobbers, and the Butterworth Supply Company of Philadelphia, also jobbers, has a wide personal acquaintance in the trade along just the line of goods manufactured by the Bridgeport Brass Company, which will enable him to give aid to jobbers' salesmen as a specialist in solving difficult plumbing problems.

Dr. Colin G. Fink, professor of electrochemistry, Columbia University, gave the Alfred Waters Proctor lecture at the Brooklyn Institute of Arts and Sciences, on the evening of November 20, 1926. Dr. Fink chose as his subject, "The Electrochemical Restoration of Ancient Bronzes and other Ancient Metal Objects of Art." On December 1, 1926, Dr. Fink addressed the Alpha chapter of the honorary engineering fraternity, Tau Beta Pi, on "Recent Advances in Electrochemistry." At the meeting of the New Jersey section of the American Chemical Society he gave an illustrated lecture on "Chromium, a Metal of Many Uses." The following evening, December 14, 1926, he addressed the Rhode Island section of the same society on "Recent Advances in Electrochemistry."

Obituaries

OLIVER O. BOWMAN

Oliver O. Bowman, dean of Trenton's manufacturers and bankers, died recently at the McKinley Hospital, Trenton, N. J., after an illness of about a year and a half. He was walking from the Broad Street National Bank, where he was a director when he fell and fractured his hip. He had been in the hospital since that time. He was in the 89th year of his age. He leaves two sons, William J. Bowman and Robert Bowman, officials of the Jordan L. Mott Company. The burial was made in the family plot in Trenton.

Born August 23, 1838, in Wilkes-Barre, Pa., Mr. Bowman was educated in the public schools of that city. He later attended the Weissport, Pa., Seminary. In 1859 he took over the business of Bowman brothers, a mercantile concern in Perryville. In 1862 the place was swept away by a flood. After serving in the Civil War as a member of the Nineteenth Pennsylvania Volunteers, he went to Trenton to engage in the manufacture of terra cotta and bricks under the firm name of O. O. Bowman & Company, which was succeeded in 1877 by the Trenton Fire Clay and Porcelain Company, of which he was the president.

It was largely due to his efforts as head of the latter concern that the removal of the Jordan L. Mott Company to Trenton from New York was affected. Mr. Bowman for a time acted as treasurer of the Mott company. He was one of the organizers and one time president of the Broad Street National Bank and a director of several institutions.

SAMUEL B. HARPER

Samuel B. Harper, 76 years old, secretary, assistant treasurer and a director of the American Silver Company, Bristol, Conn., and a director of the Bristol Brass Corporation, died December 21, 1926.

Mr. Harper, a son of Alexander and Eliza (Lowry) Harper, was born July 17, 1850, and spent his boyhood in Mount Vernon, N. Y. When a very young man he entered the employ of Landers, Frary and Clark, at their New York office, moving to New Britain about 1874, where he resided until 1900. He left their employ after thirty-one years, to take a position with the Bristol Brass and Clock Company, and moved with his family to Bristol in 1900.

He married Mary Lucretia Smith of New Britain in 1874 and seven children were born to them. He is survived by five children, four grandchildren and one brother of Port Chester, N. Y. He was active in local politics and civic affairs.

CHARLES E. GRAHAM

Charles Edward Graham, 69, of 190 Elm street, West Haven, Conn., died November 27, 1926, when stricken with a heart attack. Mr. Graham was head of James Graham & Company brass foundry, New Haven. In addition to his interests in the Graham brass foundry, he was president of the Wire Novelty Company of West Haven, and a member of the West Haven Board of Finance. He was also at one time interested in the Hack Saw Shop in Elm street, and vice-president of the New Haven Times Leader. He had served as a Representative and State Senator at Hartford, Conn. Mr. Graham had a host of friends who will mourn his loss. He was of a genial and kindly disposition and never withheld his aid from any good cause. Mr. Graham is survived by his widow and a daughter.

The firm of James Graham & Company will continue to operate under the management of his cousin Earle W. Shutter.

AUGUSTE J. ROSSI

Auguste J. Rossi passed away on September 19, 1926, following a three-day illness. He was consulting chemist of the Titanium Alloy Manufacturing Company and the Titanium Pigment Company, Inc. Dr. Rossi was the inventor of the process for the manufacture of Titanium alloy and pigment and was an internationally known chemist, having received the Perkin medal in 1918. Born in Paris in 1838, Dr. Rossi received his education there and at the age of twenty came to New York. He is survived by his sister and three daughters.

WILLIAM A. LINDSAY

William A. Lindsay, for many years in the brass foundry business, died November 23, 1926, at his home 562 East Leverington avenue, Roxboro, Pa. He was born in 1866 in Manayunk, Philadelphia, and educated in Manayunk schools and Pierce Business College. Mr. Lindsay learned the foundry business with his father Peter Lindsay whom he succeeded. He was also secretary of the Robinson Iron and Steel Company, and was prominent in Masonic circles. He is survived by his widow and three daughters.

CHARLES A. ACKERSON

Charles A. Ackerson, formerly of Rochester Car Wheel Works, Rochester, N. Y., died in Denver, October 12, 1926. He established the Syracuse Aluminum and Bronze Company, Syracuse, N. Y., after leaving the Rochester works. The Syracuse company was later merged with the American Aluminum and Bronze Corporation, Detroit, of which Mr. Ackerson was treasurer.

T. E. CUNNINGHAM

T. E. Cunningham, foundry superintendent of Crompton and Knowles Works, Worcester, Mass., died on October 19, 1926. He was one of the old employees of that firm, most popular with his men, and valued by his company.

NEWS OF THE INDUSTRY

CHASE BUYS THE HUNGERFORD COMPANY

As we go to press the U. T. Hungerford Brass and Copper Company make the following announcement:

The Chase Companies of Waterbury, Conn., have purchased the assets and good will of the U. T. Hungerford Brass & Copper Company of New York.

The Chase Companies rank among the largest manufacturers of brass and copper material in the country, with mills at Waterbury, Conn. The Hungerford Corporation is regarded as the largest distributor of brass and copper products in the country, with main office and warehouses at 80 Lafayette St., New York City, N. Y., and branches at Philadelphia, Baltimore, Boston, Cleveland, Pittsburgh, St. Louis and San Francisco.

The Chase Companies have also announced an increase in capitalization from $10,000,000 to $12,000,000 to become effective by the issuance of 20,000 additional shares of common stock, par value $100. Officers of the company stated that the increase was for the purpose of financing the purchase of the U. T. Hungerford Brass & Copper Company's assets and good will.

ROLLING MACHINERY MERGER

Effective Jan. 1, 1927, the machine business of the Blake & Johnson Company, Waterbury, Conn., was acquired by The Torrington, Manufacturing Company, Torrington, Conn., and the sales and manufacture of their product continued from that address. The Blake & Johnson Company builds chiefly cold rolling mills, steel flat wire equipment and auxiliary machinery for strips and sheets. The Torrington Manufacturing Company builds similar equipment with a wider experience in the non-ferrous field, including likewise, machinery for wire, rod, tubes and cables; and also certain additional designs for strips and sheets. The combination is logical. The principal policies of both companies will be continued without interruption. Service orders will be handled as at present, but from Torrington.

The entire sales force of the Blake & Johnson Company will join The Torrington Manufacturing Company. Wadsworth Doster, the present manager, and previously associated with The Torrington Manufacturing Company, will have charge of sales.

NEW LACQUER COMPANY

Henry V. Walker Company, 17 John St., New York, has taken over the lacquer business formerly conducted by the Miner Edgar Company of New York. The Walker Company has acquired the Miner Edgar plants at Jersey City and Belleville, N. J. The sales and technical force formerly of the Miner Edgar Company are now with Henry V. Walker Company.

The new company is organized under the laws of the state of New Jersey, and is capitalized at $500,000. The officers are: Henry V. Walker, President; Richard R. Good, Vice President; R. F. Weaver, Treasurer; William H. Thoburn, Secretary.

Dr. Walker, the president of the new company, has been engaged for many years in the nitro-cellulose industry including lacquers and enamels. The new company has acquired near Newark, N. J., a large factory site with buildings and railroad facilities. It is planned to move to the new site as soon as alterations and additions are completed.

BRASS AND COPPER INGOTS RATES

The rate of 23.5c. per 100 lb. on brass and copper ingots, in carloads, from East Liberty (Pittsburgh) Pa., to Detroit is unreasonably high, according to Examiner A. S. Parker of the Interstate Commerce Commission. A proposed rate of 28c. from Baltimore to Detroit is under suspension. The report was based on a complaint by the Federated Metals Corporation, Pittsburgh, to which award of reparation is recommended.

CLEVELAND BRASS SALE

The Elyria Belting & Machinery Company was the highest bidder for the plant and equipment of the Cleveland Brass & Copper Mills, Inc., Euclid, Ohio.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

JANUARY 3, 1927.

Waterbury industries, in general, have had a moderately prosperous year, equal if not surpassing the pre-war years, and much better than the two or three years following the war. Local leaders look for favorable conditions for next year.

"We have had a pretty fair year," said **Frederick S. Chase**, president of the **Chase Companies, Inc.** "Of course, no healthy concern is ever satisfied. Competition has been keen and prices have been low, but this very fact, based on reasonable prices for raw material, has given our customers no cause for complaint and furnished little excuse for them to experiment with substitutes for brass. We see no special clouds on the horizon for next year."

"The outlook is favorable for reasonably good employment for the rest of the Winter and for Spring," said **E. O. Goss**, president of the **Scovill Manufacturing Company.** "The past year was one of fairly satisfactory operations and comparable to the year before. Business is being conducted more and more on conservative lines which makes for greater stability."

Among outstanding events of the year in Waterbury was the increase in capital stock of the **Scovill Manufacturing Company** from $17,770,000 to $22,125,000 by means of a transfer from the surplus account of $4,425,000, issued to the stockholders in the form of a stock dividend amounting to 25 per cent. In addition, the par value of the stock was decreased from $100 to $25 by issuing four shares for each one held by the stockholders, which, with the 25 per cent stock dividend, amounted to the stockholders receiving five shares for one.

The **Gilchrist Company**, of Newark, N. J., a $250,000 concern was purchased by the **Scovill Company** in February. T. I. Driggs, vice-president of the **Scovill Manufacturing Company**, and former president of the **American Pin Company**, now a branch of Scovill's, resigned in July.

This was the biggest year in the history of the **American Brass Company**, it being estimated that if the production for December, compared with the rest of the year, the year's production would amount to 685 million pounds. Most of the local brass plants combined to put on a 'Waterbury Exhibit" at the American Institute exposition in New York, this Fall. This was described in detail in THE METAL INDUSTRY for November, 1926.

Officials of the local industries are considering establishing permanently here the exhibit of the Waterbury industries shown at the American Institute exposition in New York last Fall. **F. S. Chase**, president of the **Chase Companies, Inc.**; **E. O. Goss**, president of the **Scovill Manufacturing Company**; and **John A. Coe**, president of the **American Brass Company**, have expressed a willingness to have their concerns bear a share in maintaining it if a suitable location can be found.

Among construction projects of the year the $250,000 addition of the **Lux Clock Company** stands foremost. The **Chromium Company of America** and the **Chemical Treatment Company** combined and purchased a local plant.

The **War Department** has announced that a conditional contract for $9,000,000 for cartridge and shell parts has been given a local company in following out the plans of the national defense act. This contract is to be filled only in case of war or emergency. It is understood that the local concern is the **Scovill Manufacturing Company**, although it is believed that the **American Brass Company** and the **Chase Companies** will share in such work if it ever becomes necessary to complete

it. **John H. Goss,** vice-president of the Scovill Manufacturing Company, while disclaiming any knowledge of an actual contract, said that the war department has asked the Scovill company to outline a program for the manufacture of point percussion fuses under a sub-contract to another manufacturer who would hold the main contract for the shells and cartridges in case of war or emergency.

Officials of the **French Manufacturing Company** deny that there is any foundation to the persistent rumors that the **Frigidaire** division of the **General Motors, Inc.,** is negotiating for the purchase of the local concern. F. W. French is president of the local company which has grown from a $5,000 capitalization to a million dollar concern. It manufactures small tubing used extensively in automotive, dental, refrigerator and piano manufacture.

The branch of the **Connecticut Brass & Manufacturing Corporation** at Mixville, formerly the Cheshire Brass Company, was offered for sale at auction, last month, by the United States District Court. Although several bids were submitted, no announcement has been made as to who was the successful bidder. The main plant of the Connecticut Brass & Manufacturing Corporation, which is on Watertown avenue, this city, was not sold and it is understood that it will be started up again as soon as the sale of the branch has been confirmed. The company has been in receiver's hands since the war and has not been operating for about a year. It was started during the war to fill government contracts for munitions, but was sued by the government on charge of diverting copper to its own use and was sued by a number of creditors, finally going into a receivership. The present sale of the branch plant is said to be for the purpose of settling up its affairs and terminating the receivership.

Approximately 100 employees of the local plant of the **International Silver Company** received bonuses on their yearly earnings for Christmas presents, amounting to about $8,000. All employees who have been with the concern five years receive 5 per cent of their year's earnings.

The recent decline to the 13½ cent level for copper delivered at Naugatuck valley points resulted in heavy buying by the local industries which had been holding off for several weeks owing to unsettled conditions abroad. Close to 50 million pounds are said to have been purchased by consumers in this section during the decline.—W. R. B.

BRIDGEPORT, CONN.

JANUARY 3, 1927.

Local industries view the coming year with favorable eyes. The past year has been prosperous except for a slight slowing up during the summer and fall, which is now believed halted, as there has been a steady growth in the amount of orders filled and in employment in recent weeks. During the past year much progress was made by the industrial department of the Chamber of Commerce in inducing business to locate here, and as a result the city is the richer by a dozen or more concerns.

During the year **Warren D. Blatz** and **Walter R. Clark** were added to the directorate of the **Bridgeport Brass Company. F. D. Baker,** vice-president and director of the **Acme Shear Company,** died in October. He was prominent in the brass business of the **Holmes & Griggs Company** and influential in the organization of the **Weed Chain Company.**

The **Bridgeport Brass Company** won the first prize for the best use of art in industrial advertising at the fifth annual convention of the **National Industrial Advertising Association** last summer. The **American Tube & Stamping Company** plant here was sold to the **Stanley Works** of New Britain for a sum in the neighborhood of $3,000,000. The plant of the **Gaynor Manufacturing Company** was sold to persons said to represent the interests of the **Gaynor Brothers** for $37,000. The **Challenge Cutlery Company** plant was closed. The **Tell-Tone Manufacturing Company** purchased the plant used during the war by the Stanley Works for a sum said to be in the neighborhood of $100,000. The **General Electric Company** established an aerial delivery and passenger service to fly between its plants in this section of the country.

John B. Smiley, who has recently been elected to the presidency of the **Remington Arms Company** and **M. Hartley Dodge,** chairman of the board, presided at the five-day convention of the sales managers of the company and factory officials from all the branches in all parts of the country, San Francisco, Denver, Dallas, Minneapolis, Memphis and St. Louis being represented, which was held here last month. The business in cutlery, cash registers, arms and ammunition was discurred. President J. B. Smiley declared the concern would have its greatest growth during 1927.

There is plenty of room in Bridgeport for an expension of the **Remington Arms Company** provided the amount of business secured by the sales force in 1927 warrants it, **Harry J. Strugnell,** assistant vice-president in charge of sales, declared last week.

The **Columbia Graphophone Company, Limited,** of London, owners of a controlling interest in the **Columbia Phonograph Company** of this city, has made an offer to the minority stockholders of the local company, who hold 31,524 shares whereby the London company will pay for each of the minority shares, either $45 cash or four shares of Columbia Graphophone Company, Limited, stock.

A revision of values of the personal property of manufacturing establishments will be made by the assessors in their grand list of 1926, the assessors state, although there will be no change in valuations of land and buildings. Forms have been sent out to all the manufacturing plants for statements of actual book values of materials, supplies, work in process, finished goods, parts, machinery and equipment.—W. R. B.

TORRINGTON, CONN.

JANUARY 3, 1927.

Announcement was made during the past month that the **Torrington Manufacturing Company** had acquired the machinery division of the **Blake & Johnson Company** of Waterbury. The division will be moved to Torrington as soon as present orders are filled. Wadsworth Doster, who has been manager of the Blake & Johnson branch, will be sales manager under the Torrington concern.

The transfer includes patents, drawings, patterns and good will. This is virtually a merger of three machinery concerns as the Blake & Johnson Company in 1923 absorbed the **Sundh Company** of Philadelphia. It has been making cold rolling mills, steel flat wire equipment and auxiliary machinery for strips and sheets. The Torrington Manufacturing Company builds similar equipment with a wider experience in the nonferrous field, including machinery for wire, rods, tubes and cables; also certain designs for strips and sheets.

The Torrington Manufacturing Company was organized in Torrington about 40 years ago for the manufacture of brass articles of various kinds. The manufacture of machinery was begun in 1895. The company has a capital of $500,000. Henry G. Ellis is president.

Blake & Johnson was a pioneer in the machinery manufacturing field, having been organized in 1849. Of late years the bulk of its products have been other than machinery. Its main plant is in Waterville.

The past year was a prosperous one for Torrington industries and the outlook for the coming year is bright. There has been much building by practically all the industrial concerns here and with these increased facilities available there is expected to be increased production during the next twelve months. The labor market is steady, plants are working full time and altogether the situation is most promising. Industrial leaders here are for the most part highly optimistic.—J. H. T.

NEW BRITAIN, CONN.

JANUARY 3, 1927.

The end of 1926 brings to a conclusion one of the most prosperous years that New Britain factories have ever experienced. At no time during the past year has there been any real unemployment in the city and at all times business has been brisk. The regular dividend rates have prevailed on industrial stocks and extra dividends have been declared by several concerns, notably the **P. & F. Corbin Division** of the **American Hardware Corporation** and **Landers, Frary & Clark.** Toward the close of the year there appeared to be a slight change in the industrial situation insofar as it affected the **Stanley Works,** but officials declare it but temporary.

there an almost general wage cut of 10 per cent went into effect and there were some layoffs in some departments. This was due solely to keen competition, according to those in charge. But with all the talk, economic and political, suggestive of a business depression in the near future, there has been absolutely no evidence of its materializing here, and 1927 looms ahead with every prospect of being as active a year as the past, heads of the various industries declare.

At a meeting this month the official personnel of the **Fafnir Bearing Company** was somewhat changed by the election of **Maurice Stanley** as president of the concern and the naming of **Elisha Cooper** as chairman of the board of directors; Mr. Cooper succeeding **Howard S. Hart** and Mr. Stanley succeeding Mr. Cooper, who was the second president of the concern and who had held office for the past seven years. **R. R. Searles** remains as vice-president. **E. R. Carter, Jr.,** and **R. N. Hemenway** have been advanced from assistant secretaries to vice-presidents. Treasurer **A. G. Way** becomes secretary, with **George F. Atwater** elected his assistant. The directorate is unchanged.

About the first of the year the **Hart & Cooley Manufacturing Company** will be organized and in operation and the Hart & Cooley Company, its holding company, will also be in operation.—H. R. J.

Proposing a scientific survey of business conditions and the market, and the holding of weekly luncheons for the exchange of ideals pertaining to the industry, **Archibald Silverman,** who was elected president of the **New England Manufacturing Jewelers' and Silversmiths' Association,** at the annual meeting of the board of directors, on November 4, inaugurated his plan to foster and revivify the manufacturing jewelry industry, of this section. Membership in the association comprises manufacturing jewelers, silversmiths and allied concerns in Providence, the Attleboros and contiguous territory, the greatest centre of the industry in America. Mr. Silverman calls attention to the fact that 50 per cent of all the jewelry wage-earners in the country are employed in this territory.

H. Jorjorian, for a number of years a well-known electroplater of Providence, has returned from Detroit, Mich., where he has been located for several years and has established himself at the headquarters of the **New Acme Plating Company,** 59 Page street. Mr. Jorjorian is an expert chemist and metallurgist and claims to have recently brought out a plating material in the much sought after chromium plate finish. This new finish has a beautiful lustre and appearance on metal of any kind. Mr. Jorjorian claims that it can be utilized for plating chromium on zinc metal, zinc plate, die castings and even on iron or steel when desired. It is represented to be rust proof when finished and to be untarnishable and impossible to wear off.—W. H. M.

MIDDLE ATLANTIC STATES

ROME, N. Y.

JANUARY 3, 1927.

The prosperity of the brass and copper industry in Rome (The Copper City) during 1926 brought big revenue to all other lines and to the people of the city as well. The year was one of the best the big manufacturers ever had. Orders were extremely heavy and the output was tremendously large, although the profits were not quite up to the mark that they have been in other years, due to a variety of causes.

Profits from business must always depend, in a measure, on the keenness of the competition and at what price orders have to be taken, to get them.

While the orders on the books of the big mills here are not as heavy as the mill interests would like to have them for the first three months of 1927, still the situation gives every promise of good business. It is certain that the second quarter of the year will be especially good, because it is then that the big motor car companies go into the market for their requirements, and it is from this source that Rome brass and copper plants get a very gratifying amount of business.

The **Rome Brass & Copper Company,** the **Rome Wire Company, Spargo Wire Company, Rome Manufacturing Company, Rome Turney Radiator Company** and the **Rome Locomotive Works** look for good business for 1927, although it may not be as big as in 1926. However, it can stand a slight let-down from last year and still be good.

Stock supplies are abundant and shipping facilities to and from Rome are now in a most satisfactory situation. The barge canal proves a valuable and satisfactory route for the transportation of large quantities of copper and other supplies and will probably be used more and more each year.

Working conditions in the brass and copper plants are very satisfactory and the 5,000 or more employees are in perfect harmony with themselves and their employers. Wages are good, and work is steady with plenty of opportunities for overtime if workers desire it. The policy of absolutely fair treatment for the help is carried out in every department of every plant in the city and workers feel that employment in the big industries of this city carries an unusual degree of stability and permanency, warranting them in buying homes and planning to spend their lives in Rome.

While no immediate plans are being considered for the enlargement of the industrial plants it is expected that it is only a matter of time when extensive additions will have to be made. The great office building erected and put into use during 1926 by the **Rome Wire Company** is one of the most perfectly appointed buildings in Central New York for office workers and this is probably only the beginning of a series of building plans that ultimately will be put into operation by the brass and copper interests of this city.—W. P. D.

ROCHESTER, N. Y.

JANUARY 3, 1927.

With the holiday season at hand and the end of the old year business in the metal using industry in Rochester shows no apparent let-up, except here and there where year-end inventories are taking place. Every important plant in the city is operating at the same capacity that prevailed early last month, and in a few instances there are increases in production.

All in all Rochester's metal-using industries have enjoyed a good year, and while none of the executive heads will at present admit that 1926 was as good, from a financial viewpoint, as 1925, there is every reason to believe that in a majority of the larger plants, output was considerable larger than in the previous year.

There is nothing of importance to report for the month of December. The industrial situation shows no change from that of November. The brass foundries report a steady demand for finished materials and activity is still at a high level.

An important announcement has just gone forth to the effect that the **Robeson-Rochester Corporation** has acquired an eighteen acre industrial site in the Lincoln Park section of the city, and will proceed to erect a modern manufacturing plant. The corporation produces cutlery, household commodities and electric table utilities, and employs about 800 persons.

In discussing the prospects for 1927 various manufacturers and executive heads of big plants about the city are in an optimistic mood as to the continuation of good business. This is particularly true in the case of the **Eastman Kodak Company, the Bausch & Lomb Optical Company, General Railway Signal Company, Taylor Instrument Companies, Todd Protectograph Company, Yawman & Erbe, Stromberg-Carlson Company** and the **Pfaudler Company.**—G. B. E.

NEWARK, N. J.

JANUARY 3, 1927.

Two more concerns have fallen into the hands of receivers. Samuel I. Kessler has been appointed custodial receiver by Vice Chancellor Berry for the **Essex Ring Manufacturing Company,** jewelry manufacturers of 335 Mulberry street.

An order has been secured from Vice Chancellor Church directing the **Independent Radio Corporation** to show cause why a receiver should not be appointed to liquidate its affairs.

Judge Runyon has signed an order discharging Charles G. Wilson and Arthur T. Vanderbilt, receivers for the **Virginia-Carolina Chemical Company,** which has undergone reorganization as the Virginia-Carolina Chemical Corporation. The new company bought in the assets of the old company at a foreclosure sale. Creditors of the old company were also taken care of under the new reorganization.

The **Kiddies Metal Toy Company**, Elizabeth, N. J., has purchased several factory buildings at Plainfield, N. J., and will remove there after the first of the year. The Plainfield plant was formerly owned by the **Wasson Piston Ring Company** and was later owned by the **Bosch Magneto Company.** The toy company was organized six years ago and manufactures metal automobiles and trucks and other metal toys. The company now employ 200 hands.

The following Newark concerns have been incorporated: **Newark Clock Company, Inc.**, 2,500 shares no par, to manufacture clocks; **German-American Chemical Company**, $25,000 preferred and 7,500 shares common no par; **Hydro-Carbon Chemical Company**, $50,000; **Interstate Products Corporation**, $125,000, electrical appliances; **G. A. Kleissler Company**, sheet metals, $100,000; **Eureka Smelting & Refining Company**, 1,000 shares no par, smelting and refining business.—C. A. L.

TRENTON, N. J.

JANUARY 3, 1927.

Manufacturers engaged in metals in Trenton enjoyed a very good year and are looking for better business during the coming year. There was a slump in the trade at different times during the year, but taken as a whole it was considered pretty good. With orders coming in now for the early spring trade it is an indication that manufacturers will have no cause for complaint in 1927.

The **Duncan Mackenzie's Sons Company, Inc.**, Trenton, is planning the erection of a large plant to be located near this city. The plant will be used for foundry purposes and will be 200 feet long and 65 feet in width. The factory will cost $200,000 and will be situated on a plot of ground measuring two acres. The concern now has a factory in Trenton and is engaged in the manufacture of metals used extensively in wire mills for heat resisting castings. The Mackenzie Company is one of the few concerns making these metals. It was established by the late Duncan Mackenzie in 1856. It is the intention of the company to abandon its Trenton plant when the new factory is completed.

The following concerns have been chartered here: **Phillips' Plumbing Supply Company, Inc.**, Paterson, $25,000; **Elizabeth Electric Light & Fixture Company, Inc.**, Elizabeth, $100,000, to manufacture metal products: **Tungsten Contact Corporation**, Hoboken, $125,000, manufacture metal products; **Maddock-Megary Company**, Trenton, 400 shares no par, manufacture electrical supplies; **McIntyre Connector Company**, Passaic, $10,000, electrical supplies; **Kiddies' Metal Toys Corporation**, Elizabeth, 100 shares no par, metal toys; **Baly & Bierfreund**, Jersey City, 100 shares no par, manufacture jewelry; **Flash-Light Corporation** of New Jersey, Union City, 100 shares, testing machinery; **Fremco Products Corporation**, Elizabeth, $50,000, electrical appliances.—C. A. L.

PITTSBURGH, PA.

JANUARY 3, 1927.

With a payroll that exceeds the one for 1925 by $23,000,000, 1926 closed as the most prosperous year since 1920, according to figures given out at the Pittsburgh branch of the Federal Reserve Bank. Average increase in payrolls this year over those of 1925 was about 10 per cent, according to the bank's figures.

The metal industry, in the district and throughout Western Pennsylvania, was somewhat spotty the first six months of the year, but the last half of the year it witnessed a much better tone, with almost all manufacturers and almost all products.

Hardware in holiday lines is very active. Demand for jewelry is increasing; machinery sales are good. The automobile industry is seasonally quiet, collections are slightly better, but average somewhat slow.—H. W. R.

MIDDLE WESTERN STATES

INDIANAPOLIS, IND.

JANUARY 3, 1927.

While business throughout the trade last year was spotty at times, the total volume done will show an increase of about 10 or 12 per cent over the year before. This is not what was expected, but as some executives say, it is much better than a decrease. Much is expected, however, for 1927 and it would seem now that the expectations will be realized. The volume of inquiries being received is much heavier than at this time last year. As the year closes, actual demand is light, which is also to be expected.—E. B.

DETROIT, MICH.

JANUARY 3, 1927.

The brass and copper industry has moved in a rather calm and even trend throughout 1926 and judging from present conditions 1927 will probably make about the same showing.

Taking everything as a whole, there has been a good run of business and no one seems to be registering complaints of any consequece. Most maufacturers, however, would like to see a more promising outlook for the motor car plants. This does not mean that any one expects the automobile manufacturers to have hard picking in 1927. But it seems to be apparent that business is not going to come quite so easily as in former years, and furthermore, competition will be even more pronounced than in last year. But as Detroit manufacturers do not depend altogether on the motor car industry, even in copper and brass production, there is nothing much to worry about as a result of any particular showing.

Most of the brass and copper plants are operating, although some perhaps are not engaged in such heavy production as during the last summer.

Executives of the Michigan Copper & Brass Company and of the Detroit Copper & Brass Rolling Mills expressed themselves as well satisfied with the past year and optimistic about the future.

It is announced that the **William Moulds Brass Foundry Company** is planning for extensive additions to its plant at Benton Harbor.

D. E. Anderson, formerly with the **Cadillac Motor Car Company**, has become associated, it is stated, with the **Bohn Aluminum Company**, as sales engineer, specializing in Nelson pistons.

Final preliminary steps in the construction of its $5,000,000 foundry have been completed by the **Buick Motor Car Company**, at Flint, with the issuance of a building permit covering four buildings to be erected at a cost of $455,750.—F. J. H.

CHICAGO, ILL.

JANUARY 3, 1927.

The following charters have been granted by the Secretary of State: The **Organ Pipe Speaker Company**, 1320 Burnham Building, 160 North La Salle street, capital 200 shares non par value, manufacture and distribute radio organ pipe speakers and other radio accessories.

Thompson Marmon Company, 924 Sheridan road, capital $100,000, deal in and sell Marmon and other automobiles, accessories and parts.

Midwest Radio Specialty Corporation, increased capital stock from $7,500 to $12,500.

A charter has been granted to **Benjamin Katz, Inc.**, 218 South Wabash avenue, capitalized at $10,000, to manufacture and deal in musical instruments of every description and accessories therefor.

The **Superior Specialty & Manufacturing Company**, 628 West Jackson boulevard, with a capital of $20,000, has been granted a charter to manufacture and deal in electrical and mechanical specialties.

H. E. Maytag Company, 1835 D street, Granite City, Ill., has been incorporated to manufacture and deal in washing machines, radios, electrical devices, motors, etc.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

DECEMBER 20, 1926.

The jewelry and electroplate trades have experienced a period of autumn activity recalling the seasonal booms of former years. Many shops are working overtime, although it is believed that the improvement would have been much more decided but for the coal strike. Buying for Christmas has not, however, been so good as usual, so many towns, especially in mining and iron and steel areas, obviously being short of cash have bought sparingly. As to foreign business the orders for Canada have shown a great improvement, compensating to some extent for a small falling off in the Australian trade. Canada takes large quantities of trays, salvers, coffee sets and general tableware of very good quality, and the business shows a steady expansion.

One of the most active departments of the brass trade is that devoted to the manufacture of water taps, of which enormous quantities have been called for, through the erection of many thousands of houses in the great centers of population. The cabinet brass trade has also had a good season, which has expanded in recent weeks. In the stamped brass trade rather smaller purchases have been made than usual, although there is no doubt that in the new year buying will be, generally, on a large scale.

In the copper tube trade, a remarkable run of activity prevailed for months, the chief difficulty arising from the scarcity of coke for heating, annealing and other requirements. Towards the end of the coal strike business tapered off a little, this being attributed to the depressing effect of the strike on various industries. The trade expects to benefit later from the very large shipbuilding orders given out, which will inevitably require quantities of tubes, although the change in ship construction has reduced the demand in this direction.

The most promising department in the tube trade is that providing for water conveyance for domestic purposes. This department was initiated by the committee formed to discover extended uses for copper, and it has had an uninterrupted run of success. Until recently, the principal buyers were the north of England; London and the south taking a conservative attitude, and still preferring lead for water conveyance. But the Metropolis is now falling into line, and ordering large quantities of copper tubes. In this as in other branches of the brass trade manufacturers have adopted a self-denying attitude with regard to prices, and, at some sacrifice to themselves, have refrained from increasing the sellnig rates. Despite the large additions to the cost of production the brass trade generally has made no change in prices, the only exception being an advance in copper tubes and sheets declared a short time ago.

Makers of electrical equipment and small apparatus for electric light and power requirements are full of work, the only difficulty being that of obtaining sufficient supplies of metal and other materials. The inevitable effect of the coal strike has been to increase the pace at which householders are substituting electric lighting and heating for the use of raw fuel. To some extent, the same policy is being applied to industries, and at many works in the brass trade, the boiler plant has been taken out and electric drive or the use of oil substituted.

Those metal works which ventured some months ago to put in oil furnaces have, during the period of dear coal, found this a very profitable proposition. As compared with normally cheap coal, oil is not economical, but with coal running up to £3 and £4 a ton the use of oil has left a nice margin. There was a tense moment some weeks ago when oil supplies ran short, and production was for a time hindered. Fortunately, this did not last long, and the hindrance was only temporary. —J. H.

Business Items—Verified

Art Brass Company, Bronx, N. Y., has increased its capital stock from $250,000 to $400,000.

Handy & Harman, New York, refiners of precious metals, celebrated their sixtieth birthday on January 8, 1927.

The **Whitehead Metal Products Company,** 261 Canal street, New York, has leased space in buildings 8 and 9 at the Bush Terminal, South Brooklyn, for expansion.

A. L. Seaman & Company, 549 West Washington street, Chicago, Ill., have been appointed Chicago representative of the Hardy Metal Corporation, Seattle, Wash., manufacturers of non-corrosive contact metals.

Interstate Products Corporation, 23 Commercial street, Newark, N. J., manufactures the following items: technical supplies in precious metals; contact points in platinum, its alloys, silver and special alloys; rivets in all metals.

L. Erikson Electric Company, 7 Portland street, Boston, Mass., manufacturer of electrical appliances has indefinitely postponed its plans for the construction of a 2-story factory at Terminal street and Revere Beach Boulevard.

The **Delaware Brass and Aluminum Company,** Muncie, Ind., manufacturer of brass and aluminum products, has recently improved its facilities. This firm operates the following departments: bronze and aluminum foundry; brass machine shop, grinding room.

Home Aluminum and Bronze Company, Piqua, Ohio, manufacturer of brass and aluminum castings has moved into its new modern foundry building located at South Downing and Commercial streets. This firm operates the following departments: brass, bronze and aluminum foundry; polishing.

C. M. Hall Lamp Company, of Detroit, Mich., has purchased the entire assets of every kind and description of the **Edmunds and Jones Corporation.** The Hall organization has sold its Kenosha plant to the American Brass Company, and the unsold asests will be transferred to the home plant in Detroit.

The **Penn Brass and Bronze Works,** 107 Dobbin street, Brooklyn, N. Y., are having plans drawn for a new two-story foundry, 40 x 100 ft., to cost about $21,000. A portion will be used for an office. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, grinding room, brazing, soldering, polishing, lacquering.

Silver and gold medals have been awarded by the **United States Steel Corporation** to its employees for varying lengths of service. Silver medals were given to all who had been in the employ of the company for more than 25 years and less than 50 years. Those employed for 50 years or more will receive a gold medal.

The **Northern Blower Company,** Cleveland, Ohio, manufacturer of equipment for dust-handling and material recovery, fume removal and shavings disposal, announces the appointment of Herbert Roush-Kolb as a new sales representative at Detroit, Mich. Mr. Roush-Kolb's offices are at 2640 West Philadelphia avenue, Detroit.

James L. Mayer and **Frederick E. Oswald** announce the opening of a sales office for industrial engineering equipment at 332 So. LaSalle St., Chicago, Ill. They are now representing the Dings Magnetic Separator Company and the Saginaw Stamping & Tool Company, manufacturers of pressed steel overhead conveyor wheels, trolleys and casters.

The **National Aluminum Manufacturing Company,** 107 Main street, Peoria, Ill., has awarded a general contract to the Fred Harbers Company, Central National Bank Building, for a new one-story foundry, 80 x 150 ft., to cost $30,000. J. H. Bickles is secretary. This firm operates the following departments: brass and aluminum foundry, grinding room, polishing.

Kiddie's Metal Toys, Inc., 309 Pine street, Elizabeth, N. J., has leased a two- and three-story factory at Plainfield, N. J., for the establishment of a new plant to give employment to about 250. The present business will be removed to this location and additional equipment provided. This firm operates the following departments: bronze foundry, tool room, japanning, stamping.

The **Ashland Brass Foundry,** Ashland, Ohio, has been purchased by a group of men composed of J. H. Firestone, O. D. Firestone, Samuel Miller and E. M. Armstrong; and plans for expansion now are under way. The buyers are the principal owners of the Ashland Malleable Foundry Company. Mr. Armstrong is manager. This firm operates the following departments: brass, bronze and aluminum foundry.

The India Alkali Works, India Wharf, Boston, manufac-

turers of cleaning materials, are now the **Savogran Company**. It is felt that the new name represents the character of the Company's business more adequately than that under which the business was organized 51 years ago. No change in products, personnel or policy is involved, however. Savogran, Painters' Savogran, Marblica and Cleanite will be supplied as in the past.

The **Kennedy Valve Manufacturing Company,** of Elmira, N. Y., has adopted a group insurance program which not only provide approximately seven hundred of its nine hundred employees with sick and accident benefits but also offers them the advantages of a visiting nurse service. Underwritten by the **Metropolitan Life Insurance Company,** the plan is arranged on a co-operative basis whereby employer and employee will jointly pay the premiums.

The **E. P. Gleason Manufacturing Company, Inc.,** New York, recently organized, will take over and expand the company of same name with headquarters at 37 Murray street, manufacturer of electric lighting fixtures and equipment. The company is arranging for quantity output of a new commercial lighting unit, known as Gleasonite. George E. Mallinson is president; Perry Gleason vice-president; H. C. Albertson, treasurer and general manager.

The **Illinois Stoker Company,** Alton, Illinois, manufacturers of Illinois forced and natural draft chain grate stokers, announces the recent consolidation of the K-B Pulverizer Corporation of New York, manufacturers of the Pulverburner. The Pulverburner is now being manufactured and sold by the Illinois Stoker Company. The New York office of the Illinois Stoker Company for both stokers and pulverized fuel equipment will be at 1948 Grand Central Terminal Building.

The **Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has discontinued two of its subsidiaries and merged them into the parent company as branch works. The companies so affected are Westinghouse Electric Products Company, Mansfield, Ohio, and the George Cutter Company, South Bend, Ind. In the future they will be designated as the Mansfield Works and the Street Lighting Department, respectively, of the Westinghouse Electric & Manufacturing Company.

The **American Brass and Iron Company,** recently sold their factory at 6425 Crystal street, Detroit, and moved to the Twelfth Street Terminal Building, 5736-12th street, where they are continuing the manufacture of machined cast brass work in temporary quarters. The company expects to build a new foundry and machine shop in the Spring, with enlarged facilities for their work. This firm operates the following departments: brass machine shop, tool room, grinding room, plating, polishing.

Rundle Manufacturing Company, Milwaukee, Wis., manufacturer of plumbers' supplies, sanitary fixtures, etc., has increased its capitalization from $700,000 to $1,500,000. It is stated that a stock dividend of $560,000 has been declared, absorbing the greater part of the new issue. While the concern is building a large addition to its boiler house and making minor improvements in the works at Twenty-seventh and Cleveland avenues; no other expansion is contemplated at present. Henry Held is president and general manager.

INCORPORATIONS

Hardy Metal Corporation, 1318 Second avenue, Seattle, Wash., manufacturer of non-corrosive contact points, has been incorporated for $50,000. H. M. Fredriksen is president; H. H. Engle, vice-president and sales manager; A. W. Henning, secretary-treasurer.

The **Hartford Steel Ball Company** was incorporated in September, 1926, for the manufacture of steel balls for bearings, steel burnishing balls and metallic burnishing materials. The factory and general offices of the company are located at 609 Franklin avenue, Hartford, Conn. The personnel of the company consists of Charles H. Abbott, president and treasurer, and Charles Koehler, secretary and works manager.

The **Empire Chandelier Manufacturing Company,** Box 1894, Tulsa, Okla., has been incorporated to manufacture electric light fixtures, brass and bronze tablets, ornamental brass and iron work and to do electro-plating. The company has just completed a factory at Sand Springs, Okla. The officers are W. J. Smiley, president; H. L. Steenson, vice-president and treasurer, and C. B. Johnston, secretary. This firm will operate the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, casting shop, spinning, brazing, plating, soldering, polishing, lacquering, etc.

The **American Sign Company,** Kalamazoo, Mich., has been incorporated as the American Sign Corporation with a capitalization of $250,000, and will continue to manufacture porcelain enameled steel signs and paint, lacquer and finished electrical display signs. The company has purchased additional ground for a new factory, increasing its output by 50 per cent, and is still in the market for certain equipment. The officers are Frank E. Kelsey, president; Burton C. Wilson, vice-president and general manager; Fred W. Sutherland, secretary and treasurer; J. Ross Thompson, sales manager, Galvannealed Division; and Wray P. White, sales manager, Porcelain Division. This firm will operate, among others, the following departments: tinning, soldering, lacquering.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	$71	$72
American Hardware Corporation	$100	83	85
Anaconda Copper	50	48⅜	48½
Bristol Brass	25	4	8
International Nickel, com	25	37⅛	37⅜
International Nickel, pfd	100	104½	105
International Silver, com	100	106½	108
International Silver, pfd	100	105	107
National Enameling & Stamping	100	25	26
National Enameling & Stamping, pfd	100	81	83
National Lead Company, com	100	166	168
National Lead Company, pfd	100	117½	118½
New Jersey Zinc	100	190	200
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company (new)	..	62	65
Yale & Towne Mfg. Company, new	..	70½	72

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

JANUARY 3, 1927.

Considered from the viewpoint of tonnage produced and sold it is probably true that 1927 was the banner year for all time in the fabricating branches of the metal industry. From the beginning to the end of the year the mills have been running on full schedule.

It has been observed that the whole character and practice of merchandising and buying began to change a couple of years ago, and the effect of this change was especially noted in the past year. There has been a definite trend on the part of buyers to purchase for immediate requirements only. In 1926 practically the entire industry was conducted on that basis.

The consumers have been encouraged in this practice and it has been developed by important changes in merchandising methods. The two largest distributors of fabricated metals have opened warehouses in some of the largest cities and manufacturing centers with full stocks of a wide range of sizes of materials, making it possible for the trade to secure immediate delivery on practically all standard items of the entire line. One of the mills also adopted this policy in marketing such material as they manufacture. In addition to this, the enormous productive capacity of the various mills has enabled them to make reasonably prompt shipments of specifications which had to be specially fabricated.

The result has been that the plants have operated with not more than about two to four weeks' production on their order books, and

almost completely dependent on incoming orders from day to day to keep going. Nevertheless they have been running full time and with all available machinery in use. There have been times when the margin of profit was rather thin, but taken as a whole the results of the year are viewed with a fair degree of satisfaction and hope is expressed that the coming year will be as good.

The outstanding consuming factors have been the automobile, refrigeration, building and electrical industries. These have consumed enormous quantities of copper sheet, tube and wire and brass pipe. During the year the building trade has taken up the practice of using brass pipe for plumbing on a larger scale than ever before, extending the use even to small speculative houses and following what they had previously done with sheet copper.

The largest individual consumers of Monel metal have been those concerns making refrigerating cabinets for the ice cream trade. The cabinets are covered on top with Monel metal sheet and the corners are protected with Monel metal angles. The restaurant and hotel equipment manufacturers have also adopted Monel metal as standard for kitchen equipment. Because of the large number of apartment houses and hotels erected throughout the country this past year, the tonnage consumed in this line has been an important factor.

Nearly all the new hotels have been equipping their kitchens with nickel cooking utensils. This is a line that has been extending very rapidly during the year.

An important development of 1926 has been the increasing use of sheet nickel and seamless nickel tubes in the dairy and chemical field. Because of the increased tonnages of these products going into consumption, the manufacturers have found it possible to reduce prices materially and this in turn has greatly assisted in their more extended use. For the first time in this country the manufacture of seamless nickel tubes has been put on a sound commercial basis.

Confidence on the part of the mills in the future, is indicated by some large plant extensions that are being made as well as many new machinery installations and replacements. All consuming factors report preparations for a good year so that it is difficult even with a conservative policy to be other than optimistic.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

JANUARY 3, 1927.

GENERAL BUSINESS CONDITIONS

The business status of the whole country has been progressive and extraordinarily sound during the year just closed. Commerce and industry have enjoyed continuous expansion and fundamental conditions as measured by trade reports, appear to warrant expectations of another year of great industrial activity. Dividend payments made by industrial corporations and railroad companies in 1926 were substantially larger than those paid in 1925.

There have been some divergent trends in the situation, however, which should not be ignored. The Department of Agriculture has announced that the value of 55 principal crops in 1926 was $7,801,313,000, a decrease of $1,148,000,000, as compared with that for 1925.

COPPER

Movements in copper during the past year were on a gigantic scale. Production and domestic consumption exceeded all previous records. The strength of these influences, however, failed to raise market values to what is considered a normal level. At the beginning of 1926 the price of electrolytic copper was 14⅛ cents delivered in eastern territory. For the first four months of the year the market fluctuated between 13¾ cents and 14⅜ cents. The high point of the year was reached in August, with sales at 14½ cents. A gradual sagging condition developed during the fall and winter months, and notwithstanding very heavy sales early in December at 13½ cents, the year ended with the market on this basis which was the lowest price level in 1926.

Great expansion in domestic consumption has been made resulting in total shipments of copper to the home trade in the first eleven months of 1926 of 1,680,464,000 pounds. This is at the monthly average of 152,769,454 pounds, or at an annual rate of 1,833,233,454 pounds and compares with total deliveries for domestic account for the year 1925 of 1,662,342,000 pounds. Shipments for export during the first eleven months of last year amounted to 946,048,000 pounds, against 1,083,114,000 pounds during the corresponding months in 1925. Total deliveries by American producers for the first eleven months of 1926 amounted to 2,626,512,000 pounds compared with total deliveries for the first eleven months of 1925 of 2,602,740,000 pounds, an increase of 23,772,000 pounds.

ZINC

Paradoxical features in the zinc situation are noted. The significant item in recent developments is the fact that with the strong statisical position, the present price of 7.00 cents @ 7.05 cents St. Louis compared with the price a year ago of 8.70 cents. The deliveries for the month of November totaled 56,490 tons, of which 53,319 tons were for domestic account and 3,171 tons for export. The domestic deliveries were the highest on record, the previous "high" being 52,186 tons in August 1926. Production in November was 55,062 tons. Stocks in smelters' hands on December 1 amounted to 14,481 tons, being a reduction for the month of 1,427 tons.

Consumption last year was on an enormous scale, and the new year begins with small reserve stocks equivalent to about a week's requirements, unless final figures for December should show an increase in the carryover. Under present conditions a waiting attitude prevails among consumers. Present prices are on a basis to create interest among buyers and if general activity holds up to recent levels new demand should develop in good volume for first quarter in 1927.

TIN

Outstanding features in the tin situation during 1926 were the expanding demand, a decrease in world's visible supplies and the highest market prices since 1919. The strength of the influences which have raised values to the high point of 72.50 cents last November have been conspicuous for many months. Consumption has been in the lead, and with signs of a widening gap between requirements and supplies abnormally high prices have been essentially a reflection of a strong statistical position.

For the last three years the average price of Straits tin has been above 57.00 cents, and compares with an average price of 30.00 cents in 1921, 32.58 cents in 1922 and 42.71 cents in 1923. The thirty-year average ending December 31, 1925, was 38.07 cents. Price fluctuations in 1926 were frequent and pronounced. Market variations over the twelve month period show a spread of 14.00 cents per pound, a differential almost identical with the year 1925, the low being 58.50 cents in June and the high 72.50 cents in November. Deliveries of tin in America during the first eleven months of the past year amounted to 71,545 tons as compared with 70,295 tons for the same period in 1925, an increase of 1,250 tons. Total visible supply on December 1, 1926, amounted to 15,257 tons, and compared with 18,024 tons on January 1, 1926. The market was reactionary lately, with nearby Straits tin quoting 66.50 cents.

LEAD

Large domestic consumption, but a conservative policy of buying were major factors in the lead situation. The English coal strike also restricted foreign demand and acted as a curb on market tendencies. Present price of 7.80 cents New York was the lowest in 1926, and compares with 9.25 cents at the beginning of the year. The American Smelting & Refining Company made 29 changes in the base price of lead last year. The low point was 7.65 cents in May and the high 9.25 cents in January.

Quietness pervaded the market recently, but conditions are considered favorable on present basis. Stocks of lead are understood to be quite moderate in the hands of producers and could readily be increased without detriment to the market. A period of heavy consumption is fully anticipated in 1927.

ALUMINUM

Consumption and available supplies, through heavy domestic production and greatly increased imports, were all of unusually impressive proportions in 1926. There were some signs of slackened domestic consumption recently, however, and indications of an easier market position. Foreign makers in England and on the Continent made reductions to £105 per ton recently,

but the local market continued to quote 27 cents for 99% virgin ingot and 26 cents for Metallurgical 94-99% grade. Prospects for a larger output and the heavier importations tend to make consumers feel satisfied that the situation does not warrant any higher prices. And there may be a possibility that the trend may be slightly downward. A substantial volume of new business is expected to develop during January and auto builders will probably specify more freely for supplies during the first three months of 1927. It is therefore a question if consumers will gain much by deferring new commitments.

ANTIMONY

Early in the past year the antimony market was under strong Chinese control and the price touched the high mark of 25 cents. The abnormally high prices could not be maintained however, and by the end of the first quarter values had weakened to a low of 18 cents, with March and April shipments quoting 17 cents. At the end of April prices suffered a drastic decline, the recession carrying quotations down to 11¼ cents c. i. f. New York for May-June shipments from China. Further weakness developed in May and Chinese regulus sold down to 9.50 cents duty paid. Sales were also made at 7½ cents c. i. f. New York for June-July shipment. There was a sharp comeback in June. Buyers were eager to purchase, and for a time the recovery was equal to an advance of 3 and 4 cents per pound. The last half of the year was marked by fluctuating values.

QUICKSILVER

The statistical position of this commodity has improved recently and the market displays a strong tone both here and abroad. Consumption and production have increased, and stocks have diminished lately. Present prices are quoted at $100.50 to $101.00 per flask, the highest price in several years, and compares with an average price in 1925 of $83.55. Imports into the United States for the first ten months of 1926 were 21,177 flasks as against 16,975 flasks in the same period in 1925. Imports for the whole of 1925 were 22,781 flasks being the largest on record. Total figures for 1926 are expected to exceed those for 1925.

SILVER

The year 1926 was one of extreme fluctuations and unusual depression in the market for silver. Establishment of new low levels at New York and London showed the unsettled and uncertain conditions prevailing. There was 17⅛ cent drop in bullion price from the high 68⅝c in January to the low of 51½c in October. The closing price at end of year was quoted at 54¼ cents an ounce. These figures compare with a high of 72⅞c and a low of 66½c in 1925. The outstanding feature of the situation was the Indian Currency Commission's Report and the changes proposed in the monetary status of that country. China and India display moderate interest in the market from time to time, but there is no immediate indication discernible that silver has freed itself from disquieting factors. Stocks are heavy in India and China, and interesting developments in 1927 are a foregone conclusion.

PLATINUM

There has been no special activity or market changes lately in the platinum situation. Larger supplies have been finding their way into Great Britain lately from Russia. Production in the latter country has increased and large supplies are said to be available in Africa. Refined platinum is quoted at $105.50 to $107 per ounce.

OLD METALS

There was a good volume of shipments of old metals in 1926 both for domestic and foreign account. Market activity and prices are governed to a large extent by the course of new metals. Copper scrap has eased off in sympathy with the declining tendency for the new metal. There is a substantial foreign inquiry and a more active local demand is looked for early in the new year. Activities at present, however, are not specially extended, and consumers are slow in placing new orders. Dealers prices are quoted at 10¼c @ 10½c for heavy copper, 9c @ 9¼c for light copper, 6½c @ 6¾c for heavy brass, 8¾c @ 9c for new brass clippings, 6c @ 6¼c for heavy lead, 4c @ 4¼c for old zinc, and 19c @ 19½c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1925, 14.427—January, 1926 14.25c.—February, 14⅜c.—March, 14.25c.—April, 14.125c.—May, 14.00c.—June, 14.00c.—July, 14.25c.—August, 14.50c.—September, 14.50c.—October, 14.25c.—November, 14.00c.—December, 13.75.

Brass Mill Zinc—Average for 1925, 8.263—January, 1926, 9.00c.—February, 8.20c.—March, 7.80c.—April, 7.45c.—May, 7.20c.—June, 7.55c.—July, 7.80c.—August, 7.80c.—September, 7.85c.—October, 7.70c.—November, 7.60c.—December, 7.45c.

Daily Metal Prices for the Month of December, 1926

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	6	7	8	9	10	13	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.75	13.75	13.75	13.75	13.75	13.75	13.70	13.70	13.70	13.70	13.75	13.75	13.75
Electrolytic	13.50	13.375	13.45	13.45	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Casting	13.25	13.125	13.125	13.125	13.25	13.25	13.25	13.25	13.20	13.125	13.125	13.125	13.125
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.125	7.10	7.05	7.00	7.00	7.00	7.00	7.05	7.05	7.05	7.025	7.05	7.05
Brass Special	7.20	7.175	7.10	7.075	7.05	7.05	7.05	7.10	7.10	7.10	7.10	7.10	7.10
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	71.25	70.875	70.75	70.00	69.50	69.25	68.50	68.375	68.625	68.75	69.25	69.00	68.25
Fig 99%	69.25	68.50	68.50	68.00	67.75	67.25	66.50	66.50	66.75	66.75	67.50	67.25	66.50
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.80	7.80	7.80	7.75	7.75	7.75	7.75	7.70	7.70	7.70	7.65	7.70	7.675
Aluminum c/lb. Duty 5c/lb	27	27	27	27	27	27	27	27	27	27	27	27	27
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	14.	13.875	13.875	13.75	13.75	13.625	13.625	13.50	13.25	13.	12.75	12.75	12.75
Silver c/oz. Troy Duty Free	53.25	53.125	53.125	52.875	53.125	53.125	53.50	53.375	54.	53.75	53.50	53.75	53.50
Platinum $/oz. Troy Duty Free	110	110	110	110	110	110	110	110	110	110	110	110	107

	20	21	22	23	24	27	28	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.75	13.75	13.625	13.625	13.625	13.625	13.625	13.60	13.50	13.50	13.75	13.50	13.686
Electrolytic	13.50	13.50	13.45	13.375	13.375	13.375	13.375	13.30	13.25	13.25	13.50	13.25	13.436
Casting	13.125	13.125	13.00	13.00	13.00	13.00	12.95	12.875	12.875	12.75	13.25	12.75	13.088
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.00	7.	7.125	7.00	7.041
Brass Special	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.05	7.05	7.20	7.05	7.096
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	68.375	68.	67.625	67.25	67.	67.125	66.50	66.75	67.125	66.75	71.25	66.50	68.473
Fig 99%	66.75	66.25	65.75	65.50	65.25	65.125	64.50	64.75	65.25	65.	69.25	64.50	66.571
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.675	7.675	7.675	7.65	7.65	7.65	7.65	7.65	7.65	7.65	7.80	7.65	7.70
Aluminum c/lb. Duty 5c/lb	27	27	27	27	27	27	27	27	27	27	27	27	27
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	12.50	12.75	12.625	13.00	13.50	13.25	13.00	13.00	13.00	13.00	14.00	12.50	13.223
Silver c/oz. Troy Duty Free	53.25	53.125	53.125	53.50	53.50	53.50	54	54	54.125	54	54.125	52.875	53.484
Platinum $/oz. Troy Duty Free	107	107	107	107	107	107	107	107	107	107	110	107	108.565

Metal Prices, January 10, 1927

NEW METALS

Copper: Lake, 13.25. Electrolytic, 13.00. Casting, 12.625.
Zinc: Prime Western, 6.925. Brass Special, 7.00.
Tin: Straits, 67.25. Pig, 99%, 65.25.
Lead: 7.50. **Aluminum,** 27.00. **Antimony,** 14.00.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. 101.00. **Bismuth,** $2.70 to $2.75.
Cadmium, 60. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 53.875.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $107.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots, Red	11½to12½
Bronze Ingots	11½to12½
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	13 to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%....according to quantity...	30 to36

OLD METALS

Buying Prices		Selling Prices
11 to11½	Heavy Cut Copper	12½to13
10¾to11¼	Copper Wire	12¼to12½
9¼to 9¾	Light Copper	10¾to11
8½to 8¾	Heavy Machine Composition	10 to10¼
7¼to 7½	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7¾	No. 1 Yellow Brass Turnings	9 to 9½
8¼to 8¾	No. 1 Composition Turnings	10 to10½
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	20¾c. to 21¾c. net base
From stock	21¾c. to 22¾c. net base

BARE COPPER WIRE

15½c. to 15⅝c. net base, in carload lots.

COPPER SEAMLESS TUBING

23¾c. to 24¾c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20¼c. net base
100 lbs. to 200 lbs. in one order	20¾c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	11.50 net base
Casks, jobbers' price	12.75 net base
Open Casks, jobbers' price	13.25 to 13.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	39c.
Aluminum coils, 24 ga., base price	35.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Hot Rolled Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 55½ to 57½c.

BRASS MATERIAL—MILL SHIPMENTS

In effect January 5, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18⅛	$0.19⅝	$0.21⅝
Wire	.18⅝	.20⅛	.22⅛
Rod	.15⅞	.20⅜	.22⅜
Brazed tubing	.26⅛	.....	.31⅜
Open seam tubing	.26⅛	.....	.31⅜
Angles and channels	.29⅛	.....	.34⅜

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23c. to 24c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20⅛c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18⅛c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19⅛c. net base
Muntz or Yellow Metal Rod	16⅛c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

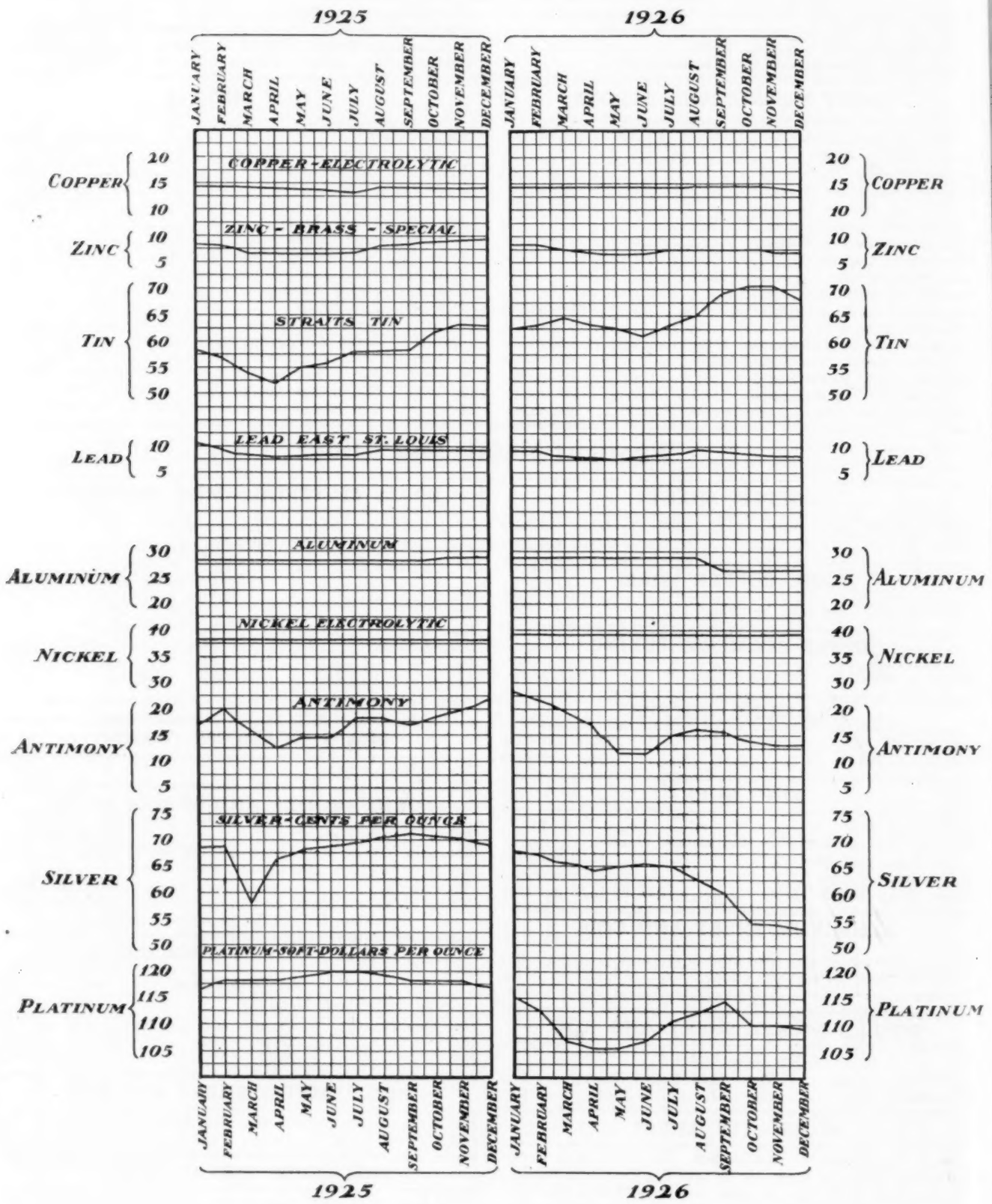
MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Hot Rolled Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c, over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Chart of Metal Prices for 1925-1926



SUPPLY PRICES ON PAGE 54

Pig Iron and Metal Products of the United States

Calendar Years 1917-1925. (1926 Estimated.)

(FROM THE UNITED STATES BUREAU OF MINES)

PRODUCTS METALLIC	1917 Quantity	1917 Value	1918 Quantity	1918 Value	1919 Quantity	1919 Value	Products
Pig iron (spot value), long tons	38,612,546	$1,053,785,975	38,230,440	$1,180,759,565	30,130,231	$775,915,043	Pig iron
Copper, sales value, pounds	1,886,120,721	514,911,000	1,908,533,595	471,408,000	1,286,419,329	239,274,000	Copper
Zinc, sales value, short tons (g)	584,597	119,258,000	492,405	89,618,000	452,272	66,032,000	Zinc
Tin, short tons	110	135,600	69	118,500	56	73,400	Tin
Lead (ref.) sales value, short tons (h)	548,450	94,333,000	539,905	76,667,000	424,433	44,990,000	Lead
Aluminum, pounds	*	45,882,000	*	41,159,000	*	38,558,000	Aluminum
Nickel, value at New York, short tons	402	331,556	441	401,000	511	434,485	Nickel
Quicksilver, value at S. Fran., flasks	36,159	3,808,266	32,883	3,863,752	21,415	1,933,560	Quicksilver
Antimonial lead, short tons (F. & D.)	18,646	3,781,560	18,570	2,826,350	13,874	1,513,968	Antim. Lead
Silver, commercial value, troy ounces	71,740,362	59,078,100	67,810,139	66,485,129	56,682,445	63,533,652	Silver
Gold, coining value, troy ounces	4,051,440	83,750,700	3,320,784	68,646,700	2,918,628	60,333,400	Gold
Platinum, New York City, troy oz.	38,831	4,023,757	59,753	6,417,980	45,109	5,614,335	Platinum
Total value of metallic products (approximate) (b)		$2,086,234,000		$2,153,318,000		$1,359,744,000	

PRODUCTS METALLIC	1920 Quantity	1920 Value	1921 Quantity	1921 Value	1922 Quantity	1922 Value	Products
Pig iron (spot value), long tons	35,710,227	$1,140,904,096	16,038,619	$389,437,792	27,670,738	$608,144,858	Pig iron
Copper, sales value, pounds	1,209,061,040	222,467,000	505,586,098	65,221,000	950,285,947	128,289,000	Copper
Zinc, sales value, short tons (g)	450,045	72,907,000	198,232	19,823,000	353,274	40,273,000	Zinc
Tin, short tons	22	22,000	4	2,400	1	912	Tin
Lead (ref.) sales value, short tons (h)	476,849	76,296,000	398,222	35,840,000	468,746	51,562,000	Lead
Aluminum, pounds	*	41,375,000	*	10,906,000	*	13,622,000	Aluminum
Nickel, value at New York, short tons	365	293,250	111	86,000	208	133,191	Nickel
Quicksilver, value at S. Fran., flasks	13,392	1,066,807	6,339	300,595	6,375	368,348	Quicksilver
Antimonial lead, short tons (F. & D.)	12,535	1,963,255	10,064	870,059	8,075	844,993	Antim. Lead
Silver, commercial value, troy ounces	55,361,573	60,801,955	53,052,441	53,052,441	56,240,048	56,240,048	Silver
Gold, coining value, troy ounces	2,476,166	51,186,900	2,422,006	50,067,300	2,363,075	48,849,100	Gold
Platinum and allied metals, value at New York City, troy ounces	41,544	4,697,722	56,370	4,238,989	57,718	5,932,726	Platinum
Total value of metallic products (approximate) (b)		$1,762,350,000		$654,130,000		$987,180,000	

PRODUCTS METALLIC	1923 Quantity	1923 Value	1924 Quantity	1924 Value	1925 Quantity	1925 Value	Products
Pig iron (spot value), long tons	38,361,379	$946,799,378	31,064,129	$665,078,972	36,814,702	$739,316,333	Pig iron
Copper, sales value, pounds	1,434,999,962	210,945,000	1,634,249,192	214,087,000	1,674,869,886	237,832,000	Copper
Zinc, sales value, short tons (g)	508,335	69,134,000	515,831	67,058,000	555,631	84,456,000	Zinc
Tin, short tons	2	1,623	7	7,000	9	9,934	Tin
Lead (ref.) sales value, short tons (h)	543,841	76,138,000	566,407	90,625,000	654,921	113,956,000	Lead
Aluminum, pounds	*	28,305,000	*	37,607,000	*	36,430,000	Aluminum
Nickel, value at New York, short tons	100	71,605	191	114,903	272	169,664	Nickel
Quicksilver, value at S. Fran., flasks	7,937	521,302	10,085	692,739	9,174	762,616	Quicksilver
Antimonial lead, short tons (F. & D.)	14,190	1,950,370	20,787	3,376,713	19,667	3,785,547	Antim. Lead
Silver, commercial value, troy ounces	73,335,170	60,134,839	65,407,186	43,822,814	66,155,424	45,911,864	Silver
Gold, coining value, troy ounces	2,502,632	51,734,000	2,528,900	52,277,000	2,411,987	49,860,200	Gold
Platinum and allied metals, value at New York City, troy ounces	49,797	5,762,305	66,007	7,611,319	49,643	5,661,809	Platinum
Total value of metallic products (approximate) (b)		$1,510,930,000		$1,232,330,000		(Not Available)	

1926 ESTIMATED†	Quantity	Value Total	Value Per Unit
Pig iron (spot value) long tons	40,000,000	$800,000,000	$20 (a)
Copper, sales value, pounds	2,000,000,000	275,000,000	13¾c. lb. (c)
Zinc, sales value, short tons	640,000	92,000,000	7¼c. lb. (d)
Tin (imports) short tons	78,000	100,000,000	65c. lb.
Lead (refined) sales value, short tons	650,000	110,000,000	8½c. lb. (c)
Aluminum, pounds	140,000,000	40,000,000	28c. lb.
Nickel, value at New York, short tons (Canadian)	40,000	28,000,000	35c. lb.
Quicksilver, value at New York, flasks	10,000	900,000	$90
Antimonial lead (short tons)	23,000	4,140,000	9c. lb.
Silver, commercial value, troy ounces	60,000,000	37,000,000	62c. (c)
Gold, coining value, troy ounces	2,400,000	48,000,000	$20
Platinum (crude), imports, ounces	4,000	450,000	$113

(†) Figures from Engineering and Mining Journal-Press.

(b) Includes some items of minor interest to metal trades not shown in table.

(*) Bureau not at liberty to publish figures.

(a) Composite (c) New York (d) St. Louis.

(g) Beginning with 1917, value based on average sales price.

(h) Beginning with 1917, value based on average sales price.

Supply Prices, January 10, 1927

ANODES

Copper:	Cast	20⅜c. per lb.
	Rolled	20⅝c. per lb.
	Electrolytic	18 c. per lb.
Brass:	Cast	19⅜c. per lb.
	Rolled	20⅝c. per lb.
Zinc:	Cast	14¼c. per lb.
Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 57c. to 59c. per Troy ounce, depending upon quantity purchased.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$27.00–28.85
14" 20 ply 64/68 Unbleached	34.75–35.90
12" 20 ply 80/92 Unbleached	28.90
14" 20 ply 80/92 Unbleached	39.20
12" 20 ply 84/92 Unbleached	32.45–39.30
14" 20 ply 84/92 Unbleached	44.00–52.80
12" 20 ply 80/84 Unbleached	24.25–35.25
14" 20 ply 80/84 Unbleached	46.40–47.50

Sewed Pieced Buffs, per lb., bleached 60–75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11–.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.32
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.18½–.23
Denatured, bbls.	gal.	.46
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.29
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05½
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.21
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17–.21
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¼
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.55
Nitrate, 100 ounce lots	oz.	.39¼
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.46½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls.	lb.	.11–.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½